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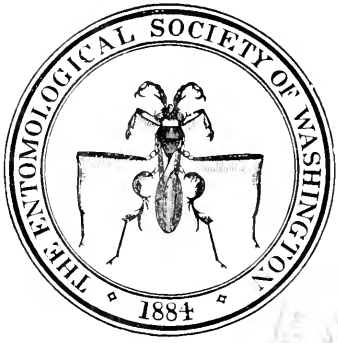
PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

WASHINGTON



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CONTENTS OF VOLUME XVII

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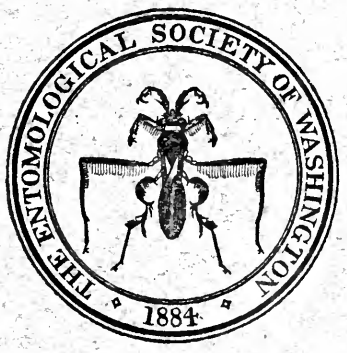

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THE ENTOMOLOGICAL SOCIETY OF WASHINGTON

ORGANIZED MARCH 12, 1884.

The regular meetings of the Society are held on the first Thursday of each month, from October to June inclusive, at 8 P. M.

Annual dues of active members, $3.00; of corresponding members $2.00; initiation fee (for active members only), $1.00.

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PROCEEDINGS

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVII 1915 No. 1

Two Hundred and Seventy-Eighth Meeting,

June 4, 1914.

The 278th regular meeting of the Society was entertained by the bachelor members at the Sængerbund Hall, June 4, 1914. There were present 20 members and two visitors.

The following paper was presented:

The Temperature of the Honey Bee Cluster as Modified by External Conditions ..... Dr. E. F. Phillips[1]

Under the head of Notes and Exhibition of Specimens, the following were presented:

Note on Rhipidandri—a Correction..... E. A. Schwarz and H. S. Barber[2]

CAPTURE OF CALLICERA JOHNSONI HUNTER.

By C. T. Greene, *Bureau of Entomology.*

A female specimen collected at Falls Church, Va., April 22, 1914, by the writer. The specimen was resting on the ground. The altitude at the point of capture is about 350 feet above sea level, the highest point at Falls Church is about 400 feet above sea level.

[1] Withdrawn from publication.

[2] Published in these Proceedings, vol. xvi, no. 4.

ON POSSIBLE POISONING OF INSECTIVOROUS BIRDS IN THE WAR AGAINST THE GIPSY MOTH.

By L. O. Howard.

The speaker mentioned the fact that the extensive use of arsenate of lead in poisoning woodlands around Boston had given rise to rumors that many insectivorous birds were being killed by the arsenic, either by feeding upon insects that had been killed by the poison or by sucking drops of the spray from the leaves of sprayed trees before the moisture had time to evaporate. He stated that Mr. William Brewster, of Concord, had noticed in the woodlands surrounding his place that several species of birds had disappeared and that he feared it was from this cause. The speaker further stated that he had mentioned this matter on a recent Boston trip to Dr. W. M. Wheeler at the Bussey Institution, and that Dr. Wheeler had stated that in his opinion the insectivorous birds had disappeared for the reason that their insect food had been destroyed and they had simply migrated to regions where their food had not been killed by the poison sprays and was therefore normally abundant. Doctor Wheeler stated that he would send his students after class material into the regions around the Bussey Institution and that they would return with very few leaf-feeding insects. These had become very scarce since spraying had become so general. The speaker stated that he asked the agents of the Bureau of Entomology in New England to search for dead birds and to send their stomachs to Washington for chemical analysis whenever they were found. (The author of this note adds, that but one dead bird has been found by the gipsy moth agents up to late September, and that its stomach showed no trace of arsenic.)

Two Hundred and Seventy-Ninth Meeting,

October 1, 1914.

The 279th regular meeting of the Society was entertained by Mr. B. A. Schwarz in the Sængerbund Hall, October 1, 1914. There were present Messrs. Abbott, Baker, Barber, Busck, Burgess, Caudell, Crawford, DeGryse, Ely, Gahan, Heinrich, Hunter, Hutchinson, Jones, Knab, Kotinsky, Myers, Menagh, Middleton, Poponoe, Pomeroy, Sanford, Sasscer, Schwarz, Shannon, Townsend, Turner, Walton, White, Wood, members, and Messrs. J. N. Summers and Edward R. Speyer, visitors.

Mr. Busck reported for the Committee appointed to draw up resolutions in commemoration of Dr. Theodore Gill.[1]

Mr. W. H. White was elected to active membership.

At the close of the program the following visitors were called on for remarks:

Mr. Edward R. Speyer, a Carnegie student, spoke of entomological conditions in England.

Mr. John N. Summers of the Gipsy Moth Laboratory, gave a short account of his recent trip to Europe and of the conditions present in the forests where the Gipsy moth occurs.

The following papers were presented:

Reply to Criticism by Aldrich, Presented at the 277th Meeting..
Dr. C. H. T. Townsend[2]

A Destructive European Pine Moth, *Evetria buoliana*, Introduced into the United States.....August Busck[3]

NOTES ON SOME BEES FROM VIRGINIA.

By T. D. A. Cockerell, *Boulder, Colorado.*

Mr. S. A. Rohwer has forwarded the following flower records referring to bees collected at Falls Church, Virginia. One of the females is undescribed and is herewith characterized.

VISITORS OF *Helianthus annuus coronatus.*

The following bees were taken collecting the pollen on the red sunflowers:

Halictus ligatus Say. det. Crawford.

Bombus pennsylvanicus (De Geer) Franklin det. Crawford.

Bombus impatiens Cresson det. Crawford.

Melissodes dentiventris Smith det. Cockerell. Mr. Rohwer notes that this bee visits the sunflowers in the mornings; he never took it in the afternoon.

[1] Published in these Proceedings, vol. XVI, no. 1.

[2] Withdrawn from publication.

[3] Withdrawn for publication elsewhere.

VISITORS OF *Phaseolus lunatus*.

The following two species are common visitors of the lima beans where they collect nectar:

Bombus pennsylvanicus (De Geer) Franklin det. Crawford.

Bombus fervidus Fabricius det. Crawford.

The following three species of *Megachile* collect pollen and are useful in cross fertilization. An especially important cross pollinator in the locality studied is the female described below.

Megachile exilis Cresson det. Cockerell.

Megachile latimanus Say det. Cockerell.

Megachile petulans Cresson.

Female. Length about 11.5 mm. Black, the tarsi slightly reddish at extreme apex, the flagellum with very obscure dark reddish spots on the joints beneath; hair of head and thorax black and white, the tuft behind wings cream-color; ventral scopa pale yellow, becoming white basally, black at extreme apex, but yellow on base of last segment; eyes dark (not green); cheeks and vertex small; vertex with black hair, clypeus with some black hair, front with black hair intermixed, face otherwise, and cheeks with white hair; clypeus and supraclypeal area shining, but closely and strongly punctured, no smooth median line on clypeus; lower edge of clypeus gently concave, with a very small median tubercle, not projecting below the margin; maxillary blades clear amber-color; first joint of labial palpi 1200 μ long, second, 975 μ, tongue extending about 1360 μ beyond labial palpi; mesothorax and scutellum densely punctured, but moderately shining between the punctures; discs of mesothorax and scutellum with black hair, but thin white hair on mesothorax anteriorly, white hair on scutellum posteriorly, and a band of dense white hair in scutello-mesothoracic suture; pleura covered with white hair; tegulæ black; wings dusky, especially apically; nervures dark; hair of legs mainly white, that on inner side of tarsi ferruginous; short joints of anterior tarsi thickened; middle and hind tarsi broadened, hind basitarsi very broad and flat; abdomen broad cordiform, shining, very finely punctured, with very narrow entire white hair-bands on hind margins of segments, that on first reduced to a fine ciliation except at sides; when the abdomen is seen from above, only a rather small amount of short black hair projects at sides; sixth dorsal segment in lateral profile short and straight, with thin black hair like that on fifth, though there is also a very delicate greyish pruinosity. Mandibles with two sharp teeth, a third truncate, and a long inner edge.

Habitat: East Falls Church, Virginia, at flowers of lima beans, along with *M. exilis* Cresson, ♂, and *M. latimanus* Say, ♀, August 9 (S. A. Rohwer). It is readily distinguished from *M. infragilis* Cresson by the 4-dentate mandibles (with the fourth or inner tooth not at all salient, merely a straight cutting edge),

and the first joint of labial palpi longer than second. From *M. relativa* Cresson by the shape of the abdomen, band in scutello-mesothoracic suture, etc. From *M. mendica* Cresson by the black hair on dorsum of sixth abdominal segment, the entire bands, etc

Two Hundred and Eightieth Meeting,

November 5, 1914.

The 280th regular meeting of the Society was entertained by Dr. L. O. Howard, in the Sængerbund Hall, November 5, 1914. There were present Messrs. Abbott, Baker, Barber, Böving, Busck, Caudell, Cory, Craighead, Crawford, DeGryse, Duckett, Ely, Fisher, Gahan, Greene, Howard, Hunter, Hutchinson, Knab, Kotinsky, McIndoo, Marlatt, Popenoe, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Simanton, Snyder, Townsend, Turner, Walton, Webb, White and Wood, members, and Dr. J. C. Bradley, Messrs. Dwight Isely, H. G. Champion and E. W. Rust, visitors.

At the close of the regular program the following visitors were called on for remarks:

Mr. Champion, a Carnegie student, spoke of the scientific societies at Oxford, and also recounted some experiments with small mutillids parasitic on cicindellid larvæ.

Dr. J. C. Bradley of Cornell University spoke of certain entomological activities now under way in New York State.

The following papers were presented:

Remarks on Dialeyrodes.....A. L. Quaintance and A. C. Baker[1]
Notes on Some of our Meetings.....S. A. Rohwer[2]

[1] Withdrawn for publication elsewhere.
[2] Withdrawn from publication.

ON ACROCERCOPS STRIGIFINITELLA CLEMENS.

By Carl Heinrich, *Branch of Forest Insects, U. S. Bureau of Entomology.*
AND
Rev. J. J. DeGryse.

HISTORICAL.

This interesting microlepidopteron was first described by Clemens in 1860 under the name *Gracilaria strigifinitella* and again by Chambers in 1872 as *G. duodecemliniella*. In 1875 Chambers redescribed it as *Ornix quercifoliella*, appending the following note: "a single specimen received from Miss Murtfeldt who informs me that the larva curls down the edge of oak leaves (sic!). In its earlier stages it is probably a leaf miner." Busck in 1902 established the above synonomy and referred the species to Walsingham's genus, *Dialectica* with the further information that he had reared a single specimen from oak leaves collected at Washington, D. C. Meyrick has since proved *Dialectica* to be a synonym of *Acrocercops* and has placed *strigifinitella* in Group C (Gen. Ins. Fasc. 123) of that genus with another North American species, a single European and several Australian forms.

In the spring of 1913 one of the authors (Heinrich) found at Falls Church, Va., a lepidopterous larva mining the midribs of chestnut, chinquapin and oak leaves. Adults reared from these and from similar larvæ in leaves of *Fagus americana*,[1] were determined by Mr. Busck as *Acrocercops strigifinitella*. Further investigations were continued by the authors during the past summer. Chestnut appears to be the favorite food plant and during mid-summer the work of the species is very common, few of the young leaves escaping infestation, some bearing as many as four separate mines. When the proper food supply is abundant, however, there is rarely more than one or two to the leaf. There are a number of generations with considerable overlapping so that larvæ are to be found any time from May till well on into October. The first larval brood appears in spring as soon as the leaves are formed. During July and August the dominant period in the seasonal life of the species is reached. Towards fall there is a gradual diminution in numbers, and during October a partial dying out of the species, due in great measure to the scarcity of new leaves which are necessary to the successful maturing of the larvæ. In the neighborhood of Washington, D. C., the last larval brood appears early in October. The manner in which the species overwinters has not been definitely

[1] Elkmont Tenn., T. E. Snyder, U. S. Bur. of Ent., Collector.

determined but our observations lead to the belief that the few larvæ which are able to feed up during October, make their cocoons before the leaves fall and pass the winter as pupæ, developing into moths early in spring.

SYNONOMY.

Gracilaria strigifinitella, Clemens—Proc. Acad. Nat. Sci. Phil., 6, 1860.
Gracilaria duodecemliniella, Chambers—Can. Ent., IV, 11, 1872.
Ornix quercifoliella, Chambers—Cin. Quart. Jn. Sci., II, 116, 1875.
Dialectica strigifinitella, Busck—Proc. Ent. Soc. Wash., V, 3, 195, 1903.
Acrocercops strigifinitella, Meyrick—Gen. Ins. 123 Fasc., 17, 1912.

EGG.

The eggs (pl. 1, fig. 3) are laid singly on the under surface of the leaves, usually near the base and between the branching ribs. They average about 0.1 mm. in length, are elliptic in circumference, flattened below and convex above, shining pearly white and minutely faceted. The period of incubation for those specimens under observation was from 4 to 6 days.

LARVA.

Upon emergence from the egg the young larva makes a short irregular linear mine just beneath the cuticle of the leaf on the under side (pl. 2, fig. 4). In this mine it passes the first two instars during both of which it is of the flat specialized gracilariid type (pl. 2, fig. 5), whitish, without legs, abdominal feet or discernible body tubercles or setæ. The head-capsule (pl. 3, figs. 1, 2) is wedge-shaped with the greatest width just forward of the tentorial bridge; the diameter of occipital foramen at dorsal extremity of hind margin $\frac{1}{2}$.[1] The frons extends a trifle more than $\frac{1}{2}$, the frontal ridges diverging slightly to the juncture of the tentorial arms, and then converging to form a short bridge (*ob*) with the hind margin which projects into head-capsule $\frac{1}{4}$. The adfrontal sclerites are fused with the frontal ridges. The tentorial bridge is a trifle less than $\frac{1}{3}$ in length, straight and thickened somewhat in the middle; the upper attachment of tentorial arms well back of middle of frontal ridges. Ocelli dorsally placed, well back from base of antennæ; strongly but unevenly pigmented; lenses absent. Antennæ 3-jointed, the basal joint short and only seen under oil immersion; the larger papilla on second joint extending nearly to apex of antenna, papillæ otherwise normal; setæ absent. Post-labrum approximately tri-

[1] In the description of the head-capsules all measurements are expressed in proportion to the greatest width of the head.

angular with apex forward of the median incision of the labrum. Labrum (pl. 2, fig. 2) rather narrow, with two setæ-bearing tubercles; median incision deep and strongly chitinized on the edges; between these and extending outwardly a small oval epipharyngeal shield (*es*) visible only under oil immersion; distal edge of median incision serrate. Mandible (pl. 2, fig. 1) flat; three-toothed; distal fourth of median edge projecting and dentate. Labium (pl. 2, fig. 3) thrust well forward, spoon-like with distal margin serrate and anterior concavity rounded; no labial palpi; under oil immersion a well defined stipes; labium extending far back into head, with no apparent articulation between mentum and sub-mentum. Salivary ducts plainly visible and joining to the front to form what appears to be a very rudimentary spinneret, seen only under oil immersion. Hypopharynx finely haired on forward portion only. Maxillæ with palpus absent; origin of lacinia in palpiger not defined; lacinia bearing two bristle-like digiti; no distinct joint between palpiger and stipes, the latter considerably elongated; cardo small and triangular. Triangular plates of hypostoma (pl. 3, fig. 1) small and separated by slightly less than $\frac{1}{2}$. On the ventral side of the head-capsule approximate to each antennal ring is a pair of hairless tubercles. Otherwise the head-capsule is smooth. Length of larva before first moult 0.75 mm.; before second moult 1.25 mm.

After the larva has moulted for the second time it bores into one of the branching ribs which it mines during the whole or greater part of the third instar. The later instars, two of which we are able to account for, are passed in the mid-rib within which the larva mines (pl. 1, fig. 5) up or down, as the case may be, and from which it emerges when ready to spin its cocoon. As a rule the path of the mine is upward, the larva emerging from the upper side of the rib near the tip (pl. 1, fig. 2). In some cases where the leaf is too small for the mid-rib to afford sufficient nourishment, the larva continues to mine from there into the fleshy part of the leaf making a large irregular blotch (pl. 1, fig. 1) quite similar to that of *Mnemonica*. This habit however is quite abnormal.

The first two instars are the only ones in which the larvæ are of the flat gracilariid type.[1] The third instar larva is transitional between these and the typical cylindrical gracilariid form of the following instars, but with pronounced affinities to the latter. It is cylindrical, has well developed spinneret, labial and maxillary palpi and appreciable body setæ. There are, however, no noticeable legs or abdominal feet and the head-capsule while

[1] During these stages they are what Trägardh designates as sap-feeders. Comp. Trägardh: Archiv. for Zoologi., Band 8, No. 9, 1913.

rounded inclines somewhat to the flattened wedge shape. The tentorial bridge and the ocelli are as in the flat instars, the latter however more strongly and evenly pigmented. The mandibles in shape approach those of the last stage.

The larva of the fourth instar does not differ essentially in structure from that of the last.

The mature larva (pl. 4, fig. 1) is in general body characters typical of the family. It is whitish, or, when it has fed up in the blotch mine, greenish, without color markings. The abdominal feet bear seven crochets in two curved rows all pointing backward (pl. 4, fig. 3). Tubercles and setæ of abdominal segment as figured (pl. 9, fig. 1); using Dyar's numbers, we would say that I is lower than II with I, III and V nearly in a straight line, IV absent or coalesced with V, VI absent; anal segment as figured (pl. 9, fig. 2). The head-capsule (pl. 5, figs 1, 2) is rounded, the dorsal side projecting over the ventral $\frac{1}{3}$; greatest width slightly lower than middle of head, well forward of tentorial bridge. Diameter of occipital foramen at dorsal extremity of hind margin $\frac{1}{2}$, at ventral extremity a trifle under $\frac{1}{2}$. Length of frons slightly over $\frac{1}{2}$; the frontal ridges converging in curved lines to a longitudinal ridge ($\frac{1}{8}$ long) connecting them with the hind margin, which projects $\frac{1}{4}$ into the head; adfrontal sclerites conspicuous but folded under frontal ridges. Tentorial bridge as in first instar; slightly less than $\frac{1}{3}$ in length; upper attachment of tentorial arms at middle of frontal ridges. Ocelli, five, in two longitudinal rows; 1, 2, 3, dorso-laterally placed; 1 and 2 grouped approximate to antennal ring; 3 back $\frac{1}{4}$; 4 and 5 grouped opposite of 3 on ventral side; all with well developed lenses; pigmented area broad and continuous under all the ocelli. Antenna (pl. 4, fig. 5) distinctly three-jointed; second joint with two papillæ and two hairs, the longer hair not extending beyond the extremity of the antenna; third joint as in *G. syringella*.[1] Post-labrum normal. Labrum (pl. 7, fig. 2) curving well down to the sides over the upper edge of the mandibles; median incision concaved and moderately deep; four pair of setæ, V and VI absent;[2] sides very thin, the lateral edges strengthened by a chitinous bar with six branches projecting inwardly for a short distance and giving a somewhat scalloped appearance to the margin. Epipharynx (pl. 7, fig. 1) densely tufted with hair-like filaments; the paired epipharyngeal plates tooth-like; epipharyngeal shield, heart-shaped, strongly chitinized and projecting beyond the median incision of the labrum. Mandible

[1] Comp. Trägardh: l. c., pp. 16–17.

[2] We have followed the system of numbering used by W. T. M. Forbes (Ann. Ent. Soc. Am., vol. III, No. 2, p. 96, 1910).

(pl. 4, fig. 4) with five teeth, one ventrally compressed; when closed the toothed edge is vertical. Labium normal with short membrana articularia; in some specimens mentum and sub-mentum appear to be fused, in others the articulation is distinct. Cardo pear-shaped with small, irregular, strongly chitinized plate at the base. The triangular plates of the hypostoma meet approximately, their hind margins forming a rounded arch which projects for $\frac{1}{4}$ into the head-capsule. Maxillary palpus three-jointed with large palpiger; lacinia has three two-jointed digiti and two setæ; the base of the lacinia bears four or five overlapping plates connected by a chitinous band with similar plates on the maxillulæ[1] (pl. 6, fig. 1; pl. 7, fig. 3). Epicranial setæ eleven on the dorsal and seven on the ventral sides; there are also a varying number of punctures and small setitious tubercles on the basal half of the dorsal side. Length of full grown larva, 6–7 mm.

The last instar is a feeding one, the species differing in this regard from *Marmara* and the true *Gracilaria* which have a final specialized stage during which the larvæ are active and have functioning mandibles but do not use them for feeding.

The entire larval period is about twenty days.

COCOON.

After it leaves its mine the larva lets itself down by a strand of silk to a more secluded place where it spins a cocoon, nearly always on the under side of a leaf near the edge or against one of the ribs. The cocoon is a double affair consisting of a thin outer layer built up from the leaf, and a second, similar, inner layer, everywhere separated from the first by from 1 to 1.5 mm. The cocoon (pl. 1, fig. 4) is 14 mm. long, white, rather flattened, oval and transparent. The outer covering is decorated along the middle with from four to ten small, pearl-like globules similar to those on the *Marmara* cocoons, but fewer in number and less brilliant. This decorating of the cocoon is quite characteristic of several Gracilariidæ. Meyrick[2] mentions two Indian species (*A. austeropa*, Meyr., and *Epicephala chalybacma*, Meyr.) which have the same habit. These bubbles are also common to the cocoons of all the species of *Marmara*. Their purpose is considerable of a mystery but, as they have the appearance of eggs, they are presumably of some protective value to the pupa. At

[1] The presence of these organs in other Lepidopterous larvæ was pointed out by Busck and Böving in their recent paper on *Mnemonica auricyanea* (Proc. Ent. Soc. Wash., XVI, 4, pp. 153, 161, 1914).

[2] Jn. Bomb. Nat. Hist. Soc., p. 118, June 1914.

a former meeting of this society[1] Mr. Busck has given an account of the manner in which they are made. His observations were on *M. salictella* Clem., but, inasmuch as there is no reason for supposing the method to be different for the other Gracilariidæ having a similar habit, we may note his remarks here. In substance he says: after the outer covering of the cocoon is completed a slit is bitten through by the larva. A small globule secreted from the anus is then forced into the opening by the mandibles, fastened by a loop of silk and the slit sewn together. This process is repeated until the bubble content of the alimentary canal is exhausted.

PUPA.

Within its silken enclosure the pupa (pl. 9, fig. 3) is plainly visible. Throughout the pupal period it is noticably active, revolving rapidly on the axis of the body when disturbed; greenish brown and structurally normal according to Chapman's classification of the Gracilariidæ.[2]

Pupal period; six to ten days in summer.

ADULT.

The imago has steely-greyish-white palpi with two black rings on the terminal joint and two, and a faint third, on the second joint. Head and face whitish, streaked with black or blackish brown, the appressed scales falling well over the eyes and front. Thorax steel grey streaked with black, the dark portions more crowded towards the center. Forewings grey, suffused with brown giving the ground color a light, rather even, brownish tint; from the costal and dorsal margins several oblique white streaks interspersed with irregular patches and lines of black scales, these markings varying considerably in intensity and distinction of definition in different specimens but averaging as shown in the drawing (pl. 8, fig. 1); the apical area dark brown shading to black; apical cilia greyish white with a median band of black or blackish brown, white at the base, this white band forming with the costal and dorsal streaks of the apical portion a nearly complete white circle about the darkened area; costal cilia brownish; dorsal cilia brownish grey. Hind wings brownish grey; cilia concolorous, darkening toward apex. Abdomen brownish grey above, silvery beneath; the segments diagonally streaked along the sides with black, the streaks meeting obscurely on the dorsum. Legs whitish, striped with black. Anal tuft black, slightly marked with grey. Viewed from below the entire insect

[1] Proc. Wash. Ent. Soc., v, 102, 1902.

[2] The Entomologist, Lond., vol. xxxv, pp. 141 142, 1902.

has a striking black and white striped appearance. The venation is given in figures 2, 3 and 4 (pl. 8). A marked feature of this species is the costal fold in the hind wing of the male shown in figure 4 (pl. 8).

Alar expanse 8 mm.

In summer the entire life cycle of the insect from egg to imago, is completed in a trifle over a month.

It is very improbable that this species should ever prove of much economic importance. Though common, its feeding does not kill or seriously disfigure the infested leaves. As we have noted the larvæ only attack the newer leaves at the ends of branches and leaders. This specialized food habit coupled with the scarcity of their proper food supply during fall effectively prevents them from becoming overabundant for more than a short period during mid-summer. Parasites and predators also play their part. Four species of Hymenoptera,[1] parasitic on the larvæ have been reared, and on two occasions *Chrysopa* larvæ were found attacking the gracilariid in its mine, piercing the mid-rib with their mandibles and sucking the juices of the larva within. While wandering about after leaving their mines a number also fall victims of the spiders and birds; but these factors of natural control are of secondary importance as compared with the failure of large numbers of the fall larvæ to secure a proper food supply.

In conclusion the writers wish to thank their good friends August Busck and Drs. Adam Böving and Charles R. Ely for many helpful suggestions. Mr. Busck has also contributed the drawings of the wing venation (pl. 8, figs. 2, 3, 4) for this paper. All the other drawings are the work of J. J. DeGryse.

Explanation of Plates.

Plate I. Egg, work and cocoon.

Fig. 1, blotch mine made by larva after it leaves the mid-rib in search for more food.

Fig. 2, opening out by the larva on leaving mid-rib in order to pupate.

Fig. 3, egg (greatly enlarged).

Fig. 4, cocoon decorated with globules.

Fig. 5, normal mode of feeding in chestnut leaf; egg (*O*); point where larva emerges from mid-rib (*ep*).

Plate II. Larva in the first and second instars.

Fig. 1, mandible (ventral view).

[1] *Sympiesis flavipes* Ashmead, *Pseudopanteles nigripes* Roh., an *Arthrolytus* sp. and a single undeterminable male of the tribe Omphalini. (Det. by S. A. Rohwer.)

Fig. 2, Labrum (*lr*); Post-labrum (*pl*); Epipharynx (by transparency) (*ex*); Epipharyngeal shield (*es*).

Fig. 3, Labium (*li*); Hypopharynx (by transparency) (*hx*); Salivary duct (*sd*); Stipes labialis (*sl*); Digiti laciniæ (*dl*); Palipiger (*pgr*); Stipes maxillaris (*s*).

Fig. 4, mine made by larva in the first and second instars; dotted line indicates path of later stage larvæ through branching rib into the mid-rib.

Fig. 5, dorsal view of larva of the first and second instars; Antenna (*at*).

PLATE III. Head-capsule of larva in the first and second instars.

Fig. 1, ventral side of head: Epicranium (*epc*); Labium (*li*); Salivary ducts (*sd*); Stipes labialis (*sl*); Maxilla (*mx*); Stipes maxillaris (*s*); Cardo (*c*); Hypostoma (*h*); Tentorial bridge (*tb*); Mandible (*md*).

Fig. 2, dorsal side of head: Epicranium (*epc*); Frons (*f*); Frontal ridge fused with adfrontal sclerite (*adfr*); Tentorial arms (*ta*); Bridge formed by meeting of frontal ridges with hind margin (*ob*); Rudimentary ocellus (*ocl*); Labrum (*lr*); Post-labrum (*pl*); Mandible (*md*); Hypopharynx (*hx*); Antennal ring (*an*); Antenna (*at*).

PLATE IV. Mature larvæ.

Fig. 1, lateral view of mature larva.

Fig. 2, thoracic leg.

Fig. 3, abdominal leg: diagram showing arrangement of hooks.

Fig. 4, mandible (ventral view).

Fig. 5, antenna (segments indicated by Roman numerals).

(If Dampf's interpretation of the antennal joints is accepted, our joint II would become joint I and the seta bearing papilla at the top, joint III. —Comp. A. Dampf: Zoolog. Jahrb. Supp. 12, Heft. 3, p. 525, 1910).

PLATE V. Head capsule of mature larvæ.

Fig. 1, dorsal view of head: Epicranium (*epc*); Frons (*f*); Frontal ridge with adfrontal sclerite (*adfr*); Tentorial arms (*ta*); Ocelli (*ocl*); Antennal ring (*an*); Antenna (*at*); Labrum (*lr*); Mandible (*md*); Maxilla (*mx*); Spinneret (*sp*).

Fig. 2, ventral view of head: Epicranium (*epc*); Maxilla (*mx*); Hypostoma (*h*); Tentorial bridge (*tb*).

PLATE VI. Trophi of mature larva.

Fig. 1, lateral view of labium and hypopharynx: Labial palpi (*lp*); Spinneret (*sp*); Salivary duct (*sd*); Stipes maxillaris (*s*); Stipes labialis (*sl*); Point of attachment of lacinia (*atl*); Maxillulæ (*mxl*).

Fig. 2, labium and maxillæ (ventral view): Spinneret (*sp*); Labial palpus (*lp*); Stipes labialis (*sl*); Mentum (*m*); Submentum (*sm*); Cardo (*c*); Maxilla (*mx*); Stipes maxillaris (*s*); Membrana articularia (*mb*).

PLATE VII. Labrum, Epipharynx, and Hypopharynx of mature larva.

Fig. 1, Epipharynx (*ex*); Epipharyngeal shield (*es*); Internal and external epipharyngeal plates (*ep*); Epipharyngeal tufts (*et*); Sensory puncture (*spt*).

Fig. 2, labrum (*lr*); Postlabrum (*pl*); Epistoma (*e*).

Fig. 3, maxillæ, maxillulæ and hypopharynx: Basal (*mp* I), median (*mp* II) and apical (*mp* III) joints of maxillary palpus; Palpiger (*pgr*); Right lobe of maxillulæ in situ (*mxl*); Left lobe of maxillulæ dissected at base and extended (*mxl'*); Overlapping plates on outer edge of maxillulæ (*pp*) analogous plates (*pp'*) at base of lacinia (*l*); Hypopharynx (*hx*); Hypopharyngeal plate (*hp*).

PLATE VIII. Adult and wing-venation.

Fig. 1, adult.

Fig. 2, venation of forewing.

Fig. 3, venation of hindwing of female.

Fig. 4, venation of hindwing of male.

PLATE IX. Larvæ and pupa.

Fig. 1, abdominal segment of mature larva.

Fig. 2, anal segment of mature larva.

Fig. 3, pupa.

In the discussion of this paper Dr. Böving complimented the authors on their careful work and called attention to the rather scant literature dealing with the epipharyngeal and hypopharyngeal structures and especially to the work of the Danish author, H. F. Hansen, who first observed the so-called maxillulæ in insects and homologized them with corresponding structures in the Crustacea.

Dr. Böving expressed his particular satisfaction in having been able to call the attention of the authors to the very valuable paper by Dr. A. Dampf [Zur Kenntnis gehäusetragender Lepidopterenlarven (Zool. Jahrb. Suppl. Bd. 12, pp. 513–608, 54 figs. 1910.)] which deals with the same morphological problems as the present paper and as the recent paper by Busck and Böving [On Mnemonica auricyanea, Wlsm. (Proc. Ent. Soc. Wash. v. xvi, pp. 151–163, pl. ix-xvi, 1915)].

He regretted very much, that he and Busck by an inexplicable slip of memory had overlooked the paper, of which Dr. Dampf had presented him a complimentary copy, when it appeared. It is a very important contribution and deserves careful consideration by all students of the morphology of Lepidoptera.

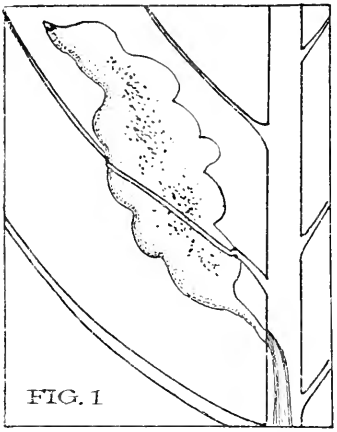


FIG. 1

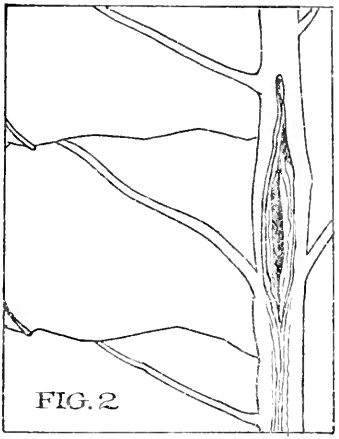
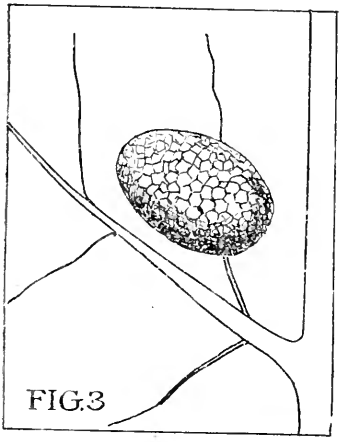


FIG. 2



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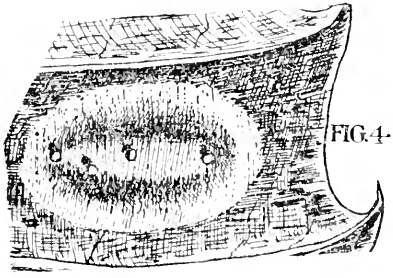

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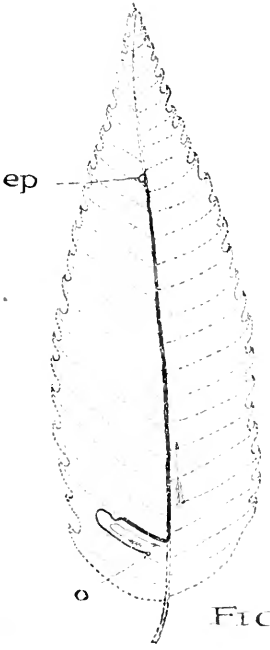

FIG. 5

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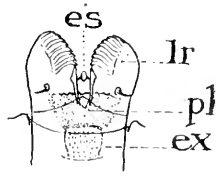
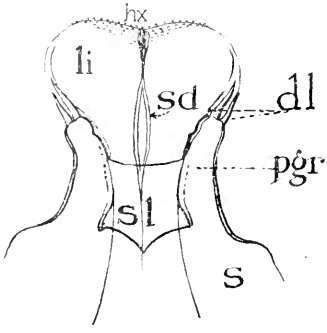


FIG. 2



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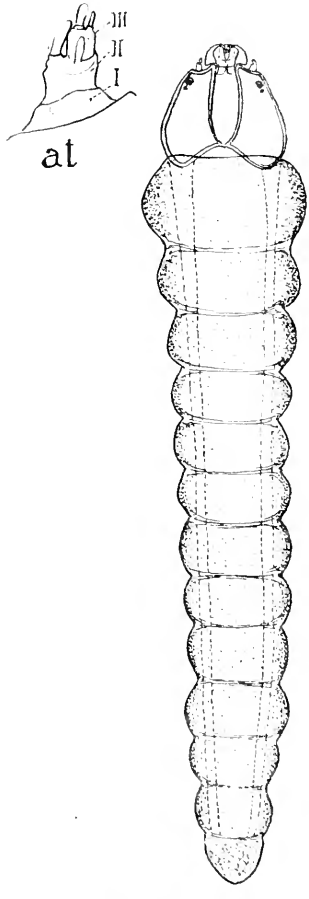


FIG. 5

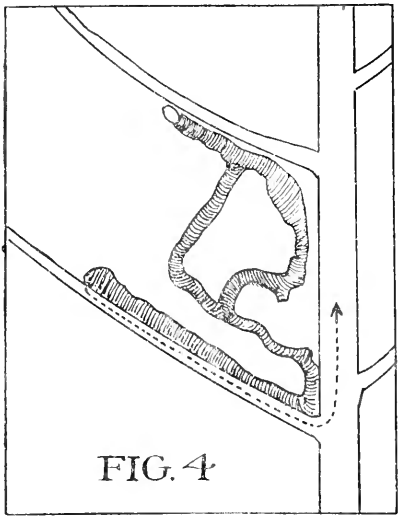


FIG. 4

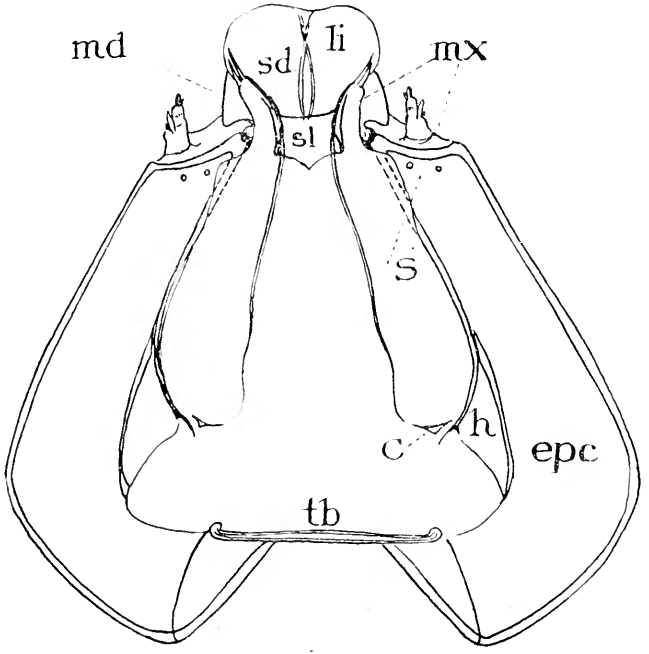
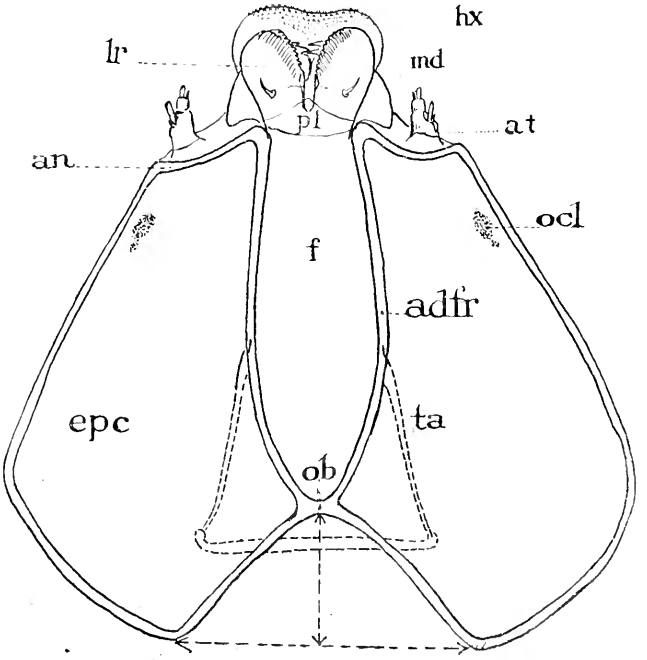


FIG. 1



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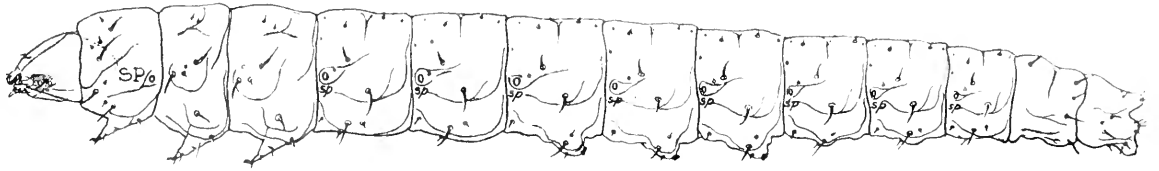
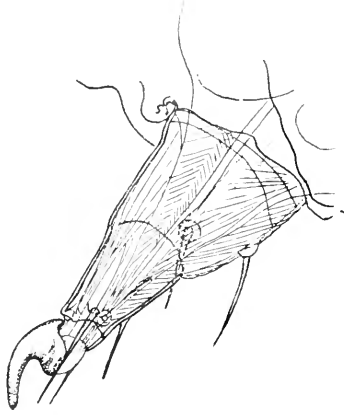


FIG. 1



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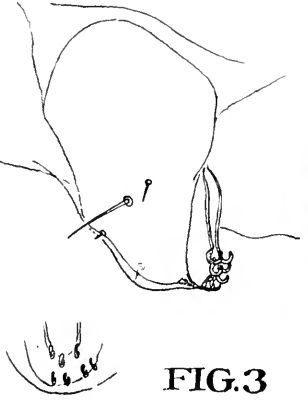

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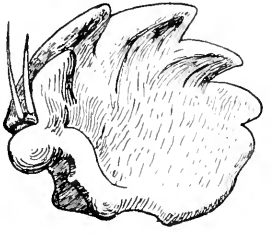

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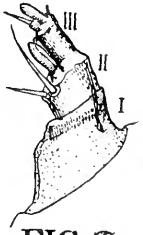

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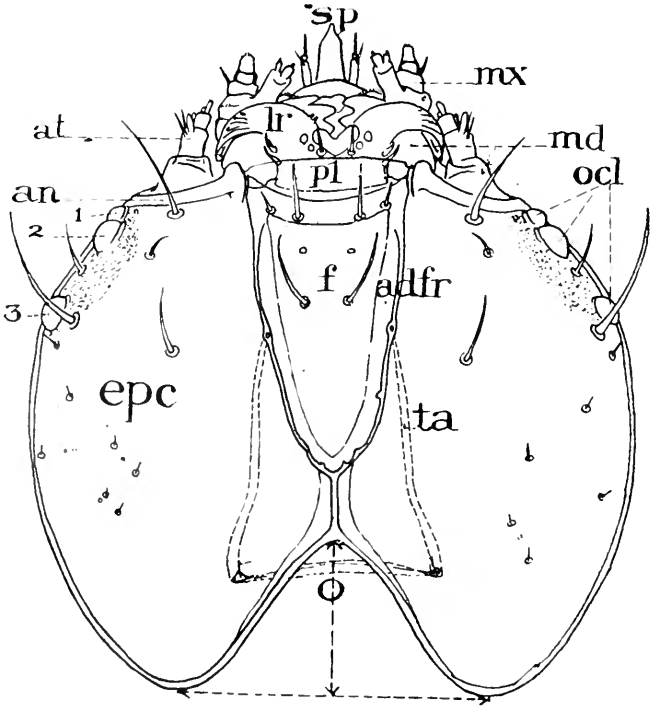

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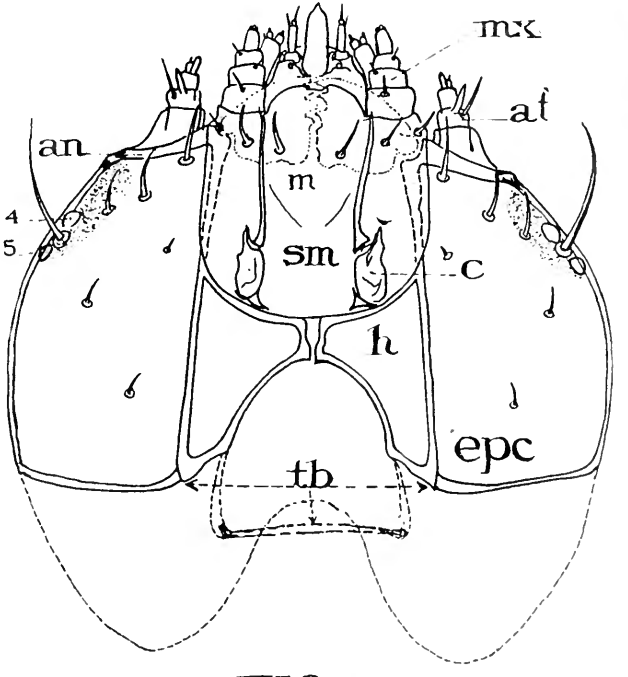

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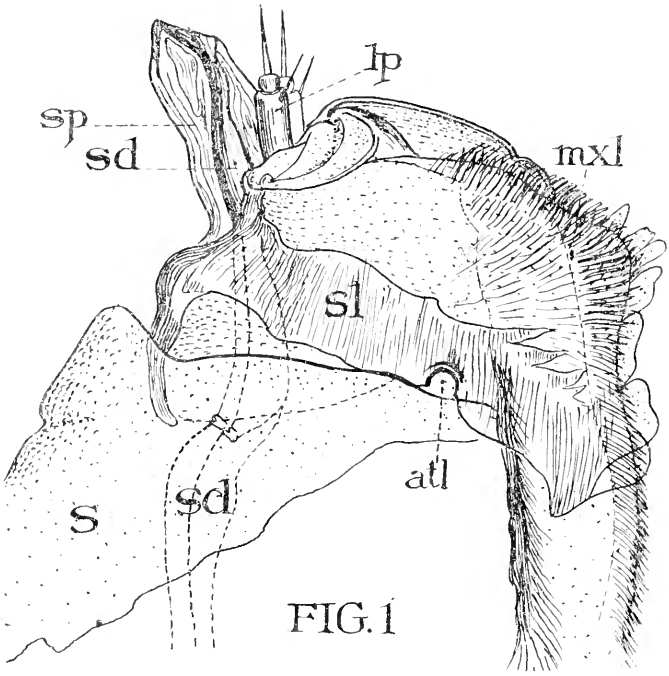

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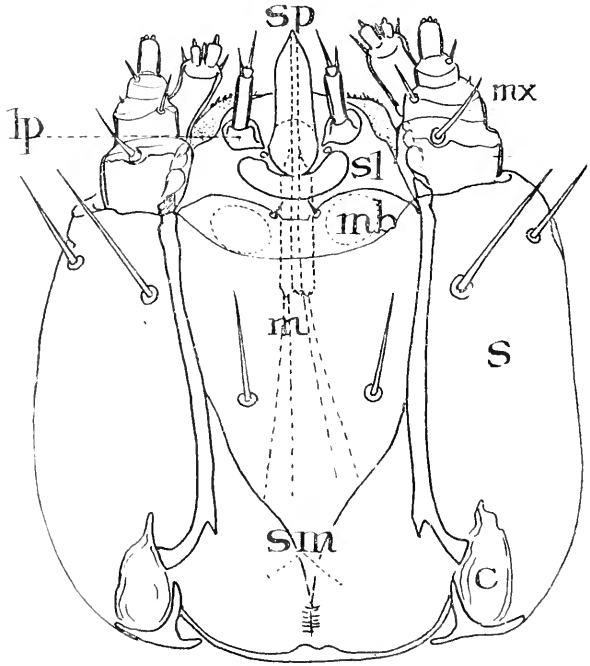

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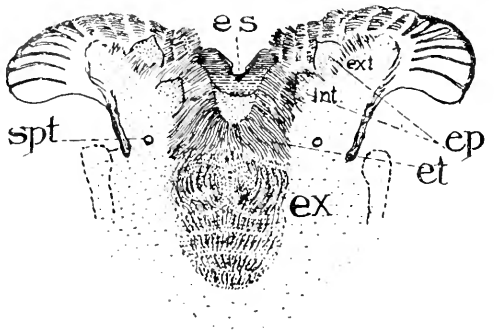

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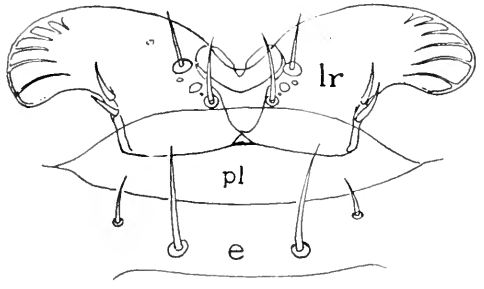

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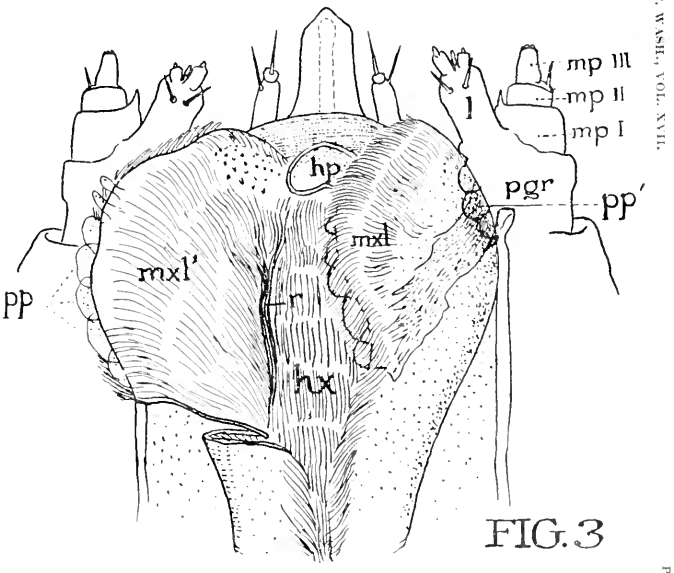

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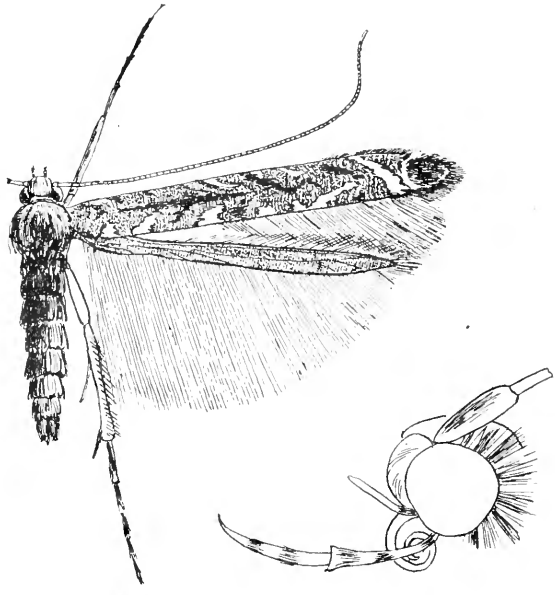

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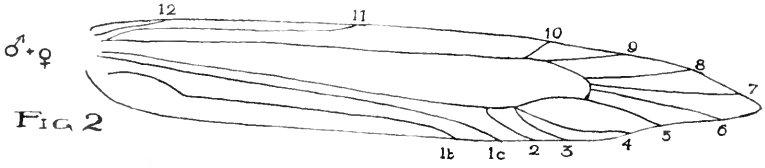

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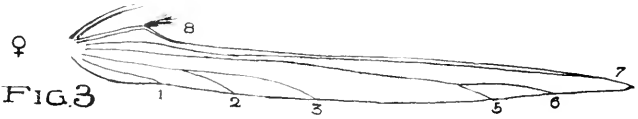

FIG. 3

FIG. 4

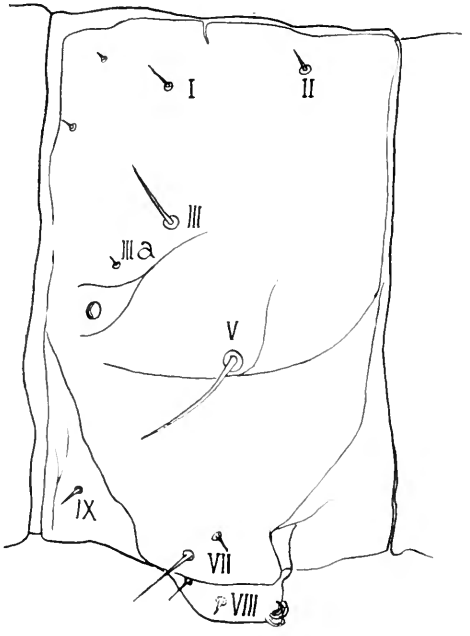

FIG. 1

FIG 2.

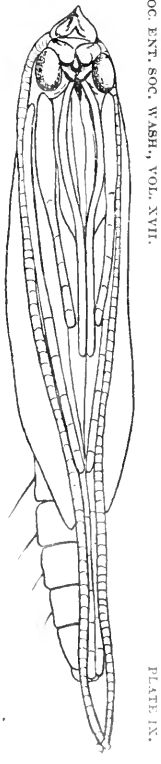

FIG 3.

NOTES ON TWO PARASITIC DIPTERA.

By A. B. Gahan.

Credit for the following interesting rearings must go to Robert Fouts, a Washington school boy who was employed as helper in the laboratory at College Park, Md., the past summer. The parasitized hosts were in both cases collected and brought to the laboratory by him.

On September 3, 1914, an adult specimen of *Stagmomantis carolina* was picked up in Washington, D. C. When secured the mantid was alive but had a hole in the side of the abdomen through which could be seen a dipterous larva. Whether this wound was due to an old injury which had become maggot-infested or whether it was made by the dipterous larva preparatory to emergence is not known. The mantid was placed in a breeding jar with some earth and on the same date three full grown dipterous larvæ crawled out of the aperture and entered the soil. On September 21, three adult sarcophagids appeared in the jar. These have been determined by Mr. W. R. Walton as *Sarcophaga* (*Helicobia*) *helicis*.

In his Seventh Report on the Insects of Missouri, Riley records the rearing of a sarcophagid which he determined as *Sarcophaga carnaria* var. *mantivora* from a female *Mantis*. In referring to this record by Professor Riley, Coquillett in Insect Life, v, p. 23, states the host as *Stagmomantis carolina*, but omits the name of the parasite. These are the only records known to the writer of the rearing of sarcophagids from mantids. Mr. E O. G. Kelly has recently shown *Sarcophaga helicis* to be parasitic on grasshoppers in Kansas (Jour. Agri. Research, U. S. Dept. Agri. vol. II, p. 441).

Two larvæ of *Leucania unipuncta* were taken at College Park, Md., July 27, 1914, and placed in a breeding jar. On July 29 there emerged from one of these larvæ a number of dipterous maggots. These pupated in the bottom of the jar and on August 6 two of the puparia produced adult tachinids. These flies were determined by Mr. Walton as *Metachata helymus*. This is believed to be the first record of a host for this species.

In discussing this paper Mr. Busck suggested the possibility that Mr. Gahan's sarcophagid fly-larvæ were not normally parasitic, but that they had gained entrance through the mouth of the mantid while the mantid was eating the mother fly; he told of one such case which he observed years ago. In 1897, he was

taking care of a brood of the large Chinese mantid *Paratenodera sinensis* Sauss., which had been bred from the eggs in the Insectary of the Bureau of Entomology. While the mantid larvæ were young and numerous they were kept together in one insect case and frequent cases of cannibalism occurred; but as they grew larger they were separated and kept each one in its own standard Riley insect case; they became quite tame and readily took living lepidopterous larvæ, flies, or even pieces of meat held by a pair of forceps. About one dozen reached maturity. One morning one of these was offered a large living sarcophagid fly held by the forceps; the mantid, eagerly grabbing it with its graspers, squeezed some living maggots out of the abdomen of the fly; several of these maggots were eaten by the mantid, two or three crawled out on its chin and were promptly wiped into the mouth. One morning sometime later this mantid was found lying on the sand in the case, alive but weak and as it was picked up three or four full grown fly maggots pushed out through the side of the abdomen; the maggots burrowed into the sand and eventually pupated, but the flies were not reared. Mr. Busck was convinced that these maggots were the ones eaten by the mantid and that they had passed the mouth parts of the greedy mantid unharmed and had been swallowed alive, and that they in this manner accidentally had become parasitic.

CATALOGUE OF RECENTLY DESCRIBED COCCIDÆ—V.[1]

By E. R. Sasscer, *Bureau of Entomology.*

Since the publication of the Catalogue of Recently Described Coccidæ—IV, October 19, 1912,[1] 4 new genera and 103 new species have been described. This makes a total of 33 new genera, 9 new subgenera, 643 new species, and 45 new varieties recorded since the appearance of Mrs. Fernald's catalogue in 1903. In preparing these catalogues the coöperation of coccidologists is earnestly solicited, especially in adding references which may have been overlooked.

[1] This catalogue is believed to be fairly complete to November, 1914, and is the continuation of a series of papers which have hitherto been published by the Bureau of Entomology, United States Department of Agriculture, as Technical Series, No. 12, Part I; Technical Series, No. 16, Part III; Technical Series, No 16, Part IV; Technical Series, No. 16, Part VI; and Technical Series, No. 16, Part VII.

Subfamily **MONOPHLEBINÆ.**

Aspidoproctus bouvieri Vayssiere.

Aspidiotus bouvieri Vayss., Bul. Soc. Ent. Fr., 10, p. 333 (1914).
Habitat—Gabun, French Equatorial Africa.
On ?

Aspidoproctus serrei Vayssiere.

Aspidoproctus serrei Vayss., Bul. Soc. Ent. Fr., 10, p. 334 (1914).
Habitat—Batavia (Java).
On?

Dròsicha lichenoides Cockerell.

Drosicha lichenoides Ckll., Jn. Econ. Ent., VI, 1, p. 142 (1913).
Habitat—Philippine Islands.
On *Ficus nota.*

Lophococcus vuilleti Vayssiere.

Lophococcus vuilleti Vayss., Ann. Service Epiphyties, I, p. 424 (1913). Fig.
Habitat—Koulikoro (?), West Africa.
On *Acacia pennata.*

Icerya genistæ Hempel.

Icerya genistæ Hemp., Cat. Faun. Brazil, III, S. Paulo, pp. 18, 55 (1912).
Habitat—S. Paulo, Brazil.
On *Genista scoparia, Lespedeza striata,* strawberry (*Fragaria* sp.).

Icerya jacobsoni Green.

Icerya jacobsoni Green, Tijdschr. Ent., LV, p. 316 (1913). Fig.
Habitat—Java.
On *Dombeya acutangula.*

Icerya zeteki Cockerell.

Icerya zeteki Ckll., Jn. Econ. Ent., VII, 1, p. 148 (1914).
Habitat—Panama Canal Zone.
On ?

Llaveia luzonica Cockerell.

Llaveia luzonica Ckll., Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 334 (1914).
Habitat—Philippine Islands.
On ?

Monophlebus dugesi Vayssiere.

Monophlebus dugesi Vayss., Bul. Soc. Ent. Fr., 10, p. 335 (1914).
Habitat—Guanajuato (Mexico).
On ?

Palæococcus morrilli Cockerell.

Palæococcus morrilli Ckll., Ent. News, XXV, 3, p. 110 (1914).
Habitat—Arizona.
On ?

Subfamily **MARGARODINÆ.**

Kuwania britannica Green.[1]

Kuwania britannica Green, Ent. Mo. Mag., 2nd ser., XXV, p. 197 (1914). Fig.

Habitat—England.

On birch.

Margarodes indicus Green.

Margarodes indicus Green, Rec. Indian Mus., VII, pt. 1, No. 5, p. 69 (1912). Fig.

Habitat—India.

On ?

Margarodes niger Green.

Margarodes niger Green, Rec. Indian Mus., VII, pt. 1, No. 5, p. 75 (1912).

Habitat—Mysore.

In soil.

Margarodes papillosus Green.

Margarodes papillosus Green, Rec. Indian Mus., VII, pt. 1, No. 5, p. 74 (1912). Fig.

Habitat—Mysore.

In soil under rose.

Genus **NEOMARGARODES** Green. Type, **erythrocephala.**

Neomargarodes Green, Novitates Zoologicae, XXI, p. 263 (1914). Fig.

Neomargarodes erythrocephala Green.

Neomargarodes erythrocephala Green, Novitates Zoologicae, XXI, p. 263, (1914).

Habitat—Sahara Desert, Algeria.

On ?

Xylococcus napiformis Kuwana.

Xylococcus napiformis Kuwana, Jn. Ent. and Zool., Pomona, VI, 1, p. 1 (1914). Fig.

Habitat—Japan.

On *Quercus serrata.*

Subfamily **DACTYLOPINÆ.**

Eriococcus cockerelli Essig.

Eriococcus cockerelli Essig, Jn. Ent. and Zool., Pomona, V, 4, p. 179, (1913). Fig.

Habitat—Sonora, Mexico.

On "Chino."

[1] This appears to be a synonym of *Steingelia goodetskia* Nass.

Eriococcus festucæ Kuwana and Fukaya.

Eriococcus festucæ Kuw. and Fuk., Jn. Ent. and Zool., Pomona, VI, 1, p. 2 (1914). Fig.

Habitat—Japan.

On *Festuca parrigluma*.

Kermes branigani King.

Kermes branigani King, Jn. Ent. and Zool., Pomona, VI, 2, p. 100 (1914). Fig.

Habitat—California.

On maul oak (*Quercus chrysolepis*).

Kermes cordiformis Lindinger.

Kermes cordiformis Lindgr., Die Schildläuse, p. 286 (1912).

Habitat—Trieste, Austria.

On *Quercus robur*.

Kermes essigii King.

Kermes essigii King, Jn. Ent. and Zool., Pomona, V, 4, p. 205 (1913). Fig.

Habitat—California.

On *Quercus agrifolia*.

Kermes lindingeri King.

Kermes lindingeri King, Ent. Rundschau, XXXI, 6, p. 34 (1914).

Habitat—Germany.

On *Quercus sessiliflora*.

Kermes occidentalis King.

Kermes occidentalis King, Jn. Ent. and Zool., Pomona, V, 4, p. 206 (1913).

Habitat—California.

On *Quercus* sp.

Kermes sasseeri King.

Kermes sasseeri King, Jn. Ent. and Zool., Pomona, VI, 1, p. 48 (1914). Fig.

Habitat—Mass., Pa., N. Y., Calif., R. I., Canada.

On *Quercus rubra*.

Kermes waldeni King.

Kermes waldeni King, Jn. Econ. Ent., VII, 1, p. 150 (1914).

Habitat—Connecticut.

On *Quercus* sp.

Lachnodius greeni Vayssiere.

Lachnodius greeni Vayss., Bul. Soc. Ent. Fr., 5, p. 156 (1914).
Vayss., Bul. Soc. Ent. Fr., 7, p. 208 (1914).

Habitat—Madagascar.

On Coffee roots and trunks (in ground).

Phenacoccus azaleæ Kuwana.

Phenacoccus azaleæ Kuw., Jn. Ent. and Zool., Pomona, VI, 1, p. 1 (1914). Fig.

Habitat—Japan.

On Azalea.

Trionymus violascens Cockerell.

Trionymus violascens Ckll., Jn. Econ. Ent., VI, 1, p. 143 (1913).

Habitat—Colorado.

On *Agropyron*.

Phenacoccus betheli Cockerell.

Phenacoccus betheli Ckll., Can Ent., XLIV, 10, p. 301 (1912).
Can. Ent., XLV, 1, p. 14 (1913).

Habitat—Arizona, Colorado.

On *Amelanchier*.

Pseudococcus calluneti Lindinger.

Pseudococcus calluneti Lindgr., Die Schildläuse, p. 90 (1912).

Habitat—Denmark.

On *Calluna*.

Pseudococcus capensis Brain.

Pseudococcus capensis Brain, Ann. Ent. Soc. Am., V, 2, p. 182 (1912). Fig.

Habitat—South Africa.

On *Phytolacca dioica, Albizzia lophantha, Solanum sodomæum, Clematis vitalba, Pelargonium* sp., *Sonchus oleraceus, Senecio vulgaris, Malva parviflora, Oxalis cernua,* stored pumpkins and vines.

Pseudococcus fragilis Brain.

Pseudococcus fragilis Brain, Ann. Ent. Soc. America, V, 2, p. 186 (1912).

Habitat—South Africa.

On Orange.

Pseudococcus lounsburyi Brain.

Pseudococcus lounsburyi Brain, Ann. Ent. Soc. America, V, 2, p. 179 (1912). Fig.

Habitat—South Africa.

On *Agapanthus umbellatus*.

Pseudococcus marchali Vayssiere.

Pseudococcus marchali Vayss., Bul. Soc. Ent. Fr., 17, p. 366 (1912). Fig.
Vayss., Ann. Service Epiphyties, I, p. 428 (1913).

Habitat—Upper Guinea, Africa.

On mango.

Pseudococcus muraltiæ Brain.

Pseudococcus muraltiæ Brain, Ann. Ent. Soc. America, V, 2, p. 184 (1912). Fig.

Habitat—South Africa.

On *Muraltia heisteria*.

Pseudococcus nicotianæ Leonardi.

Pseudococcus nicotiana Leon., Boll. Tec. d. Colt. d. Talae. (Scafati), XII, 2, p. 76 (1913).

Habitat—Prov. Salerno, Italy.

On *Nicotiana colossea*, *N. macrophylla*.

Pseudococcus phoradendri Cockerell.

Pseudococcus phoradendri Ckll., Jn. N. Y. Ent. Soc., XX, 2, p. 133 (1912).

Habitat—Arizona.

In hollow stems of *Phoradendron flavescens*, var. *villosum*, attended by *Cremastogaster arizonensis* Wheeler.

Pseudococcus wachendorfiæ Brain.

Pseudococcus wachendorfiæ Brain, Ann. Ent. Soc. America, v. 2, p. 183 (1912). Fig.

Habitat—South Africa.

On *Wachendorfia paniculata*.

Pseudococcus yerba-santæ Essig.

Pseudococcus yerba-santa Essig, Jn. Ent. and Zool., v. 2, p. 85 (1913). Fig.

Habitat—California.

On Yerba Santa or Mountain Balm (*Eriodictyon californicum*).

Ripersia taquaræ Hempel.

Ripersia taquara Hemp., Cat. Faun. Brazil, III, S. Paulo, pp. 25, 58 (1912).

Habitat—S. Paulo, Brazil.

On interior of large cane accompanied by ants.

Subfamily **TACHARDINÆ**.

Tachardia angulata Froggatt.

Tachardia angulata Frogatt, Pr. Linn. Soc. N. S. Wales, XXXVI, 1, p. 154 (1911).

Habitat—N. S. Wales.

On quince trees.

Genus **COLOBOPYGA** Brèthes. Type, **magnani.**

Colobopyga Brèthes, An. Mus. Nac. Buenos Aires, XXIII, p. 279 (1912).

Colobopyga magnani Brèthes.

Colobopyga magnani Brèthes, An. Mus. Nac. Buenos Aires, XXIII, p. 281 (1912).

Habitat—Buenos Aires.

On *Chamaerops humilis*.

Subfamily **COCCINÆ.**

Aclerda signoreti Lindinger.

Aclerda signoreti Lindgr., Die Schildläuse, p. 170 (1912).
Habitat—France, Austria.
On grass.

Ceronema africana Scott Macfie.

Ceronema africana Scott Macfie, Bul. Ent. Res., IV, 1, p. 31 (1913). Fig. Vayss., Bul. Soc. Ent. Fr., 7, p. 208 (1914).
Habitat—Northern Nigeria.
On "Pride of Barbadoes" (*Casalpinia pulcherrima*).

Ceroplastes coniformis Newstead.

Ceroplastes coniformis Newst., Bul. Ent. Res., IV, 1, p. 72 (1913). Fig. Gowdey, Bul. Ent. Res., IV, 3, p. 248 (1913).
Habitat—Uganda.
On *Ficus* sp.

Ceroplastes excœcariæ Hempel.

Ceroplastes excœcariæ Hemp., Cat. Faun. Brazil, III, S. Paulo, pp. 33, 66 (1912). Fig.
Habitat—S. Paulo, Brazil.
On *Excœcaria biglandulosa*.

Ceroplastes gigas Cockerell.

Ceroplastes gigas Ckll., Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 331 (1914). Fig.
Habitat—Philippine Islands.
On ?

Coccus citricola Campbell.

Coccus citricola Campb., Ent. News, XXV, 5, p. 222 (1914).
Habitat—California.
On Citrus.

Lecanium filamentosum Newstead.

Eulecanium filamentosum Newst., Bul. Ent. Res., IV, 1, p. 74 (1913). Fig.
Gowdey, Bul. Ent. Res., IV, 3, p. 248 (1913).
Habitat—Uganda.
On unknown forest shrub.

Lecanium opimum Green.

Lecanium opimum Green, Tijdschr. Ent., LV, p. 313 (1913). Fig.
Habitat—Java.
On *Cassia fistula*.

Lecanium perinflatum Cockerell.

Lecanium perinflatum Ckll., Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 332 (1914). Fig.

Habitat—Argentine Republic.

On herbaceous plant.

Lecanium pseudomagnoliarum Kuwana.

Eulecanium pseudomagnoliarum Kuw., Jn. Ent. and Zool., Pomona, VI, 1, p. 7 (1914). Fig.

Habitat—Japan.

On *citrus*.

Mesolecanium lucidum Hempel.

Mesolecanium lucidum Hemp., Cat. Faun, Brazil, III, S. Paulo, pp. 38, 67 (1912).

Habitat—State of Rio Grande do Sul, Brazil.

On Solanaceæ.

Paralecanium luzonicum Cockerell.

Paralecanium luzonicum Ckll., Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 333 (1914).

Habitat—Philippine Islands.

On *Plectronia viridis*.[1]

Protopulvinaria longivalvata bakeri Cockerell.

Protopulvinaria longivalvata bakeri Ckll., Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 333 (1914). Fig.

Habitat—Philippine Islands.

On leaves of *Voacanga globosa*.[2]

Pseudokermes cooleyi King.

Pseudokermes cooleyi King, Jn. Econ. Ent., VII, 2, p. 246 (1914).

Habitat—Montana.

On *Picea englemanni*.

Pulvinaria citricola Kuwana.

Pulvinaria citricola Kuw., Jn. Ent. and Zool., Pomona, VI, 1, p. 3 (1914). Fig.

Habitat—Japan.

On Citrus, *Diaspyros kaki*, *Hibiscus syriacus*.

Pulvinaria idesiæ Kuwana.

Pulvinaria idesiæ Kuw., Jn. Ent. and Zool., Pomona, VI, 1, p. 6 (1914). Fig.

Habitat—Japan.

On *Idesia polycarpa*, *Phellodendron amurensis*.

[1] Incorrectly cited as *Alectronia*.

[2] Incorrectly cited as "bocanga."

Pulvinaria okitsuensis Kuwana.

Pulvinaria okitsuensis Kuw., Jn. Ent., and Zool., Pomona, VI, 1, p. 5 (1914). Fig.

Habitat—Japan.

On Orange.

Pulvinaria ornata Hempel.

Pulvinaria ornata Hemp., Cat. Faun. Brazil, III, S. Paulo. pp. 28, 61 (1912).

Habitat—S. Paulo, Brazil.

On *Arrabidæa.* (Bignoniaceæ)

Pulvinaria photiniæ Kuwana.

Pulvinaria photiniæ Kuw., Jn. Ent. and Zool., Pomona, VI, 1, p. 4 (1914). Fig.

Habitat—Japan.

On *Photinia villosa, Celtis sinensis.*

Megasaissetia brasiliensis Hempel.

Megasaissetia brasiliensis Hemp., Cat. Faun. Brazil., III, S. Paulo, pp. 42, 68 (1912).

Habitat—S. Paulo, Brazil.

On ?

Saissetia lucida Hempel.

Saissetia lucida Hemp., Cat. Faun. Brazil, III, S. Paulo, pp. 41, 60 (1912).

Habitat—S. Paulo, Brazil.

On bark of forest tree.

Stictococcus gowdeyi Newstead.

Stictococcus gowdeyi Newst., Bul. Ent. Res., IV, 1, p. 70 (1913). Fig.
Gowdey, Bul. Ent. Res., IV, 3, p. 249 (1913).
Gowdey, Ann. Rept. Dept. Agr., Uganda Protec., p. 29 (1913).

Habitat—Uganda.

On *Haronga madagascariensis;* Coffee.

Subfamily **DIASPINÆ.**

Aspidiotus alatus Froggatt.

Aspidiotus alatus Froggatt, Agr. Gaz. N. S. W., XXV, 2, p. 132 (1914). Fig.

Habitat—New South Wales, Victoria.

On *Eucalyptus rostrata, Eucalyptus* sp.

Aspidiotus confusus Froggatt.

Aspidiotus confusus Frogg., Agr. Gaz., N. S. W., XXV, 2, p. 136 (1914). Fig.

Habitat—New South Wales.

On white gum (*Eucalyptus* sp.).

Aspidiotus ephedrarum Lindinger.

Aspidiotus ephedrarum Lindgr., Die Schildläuse, p. 139 (1912).
Habitat—Sardinia, South East Spain.
On *Ephedra nebrodensis, E. scoparia.*

Aspidiotus gidgei Froggatt.

Aspidiotus gidgei Frogg., Agr. Gaz. N. S. W., xxv, 4, p. 313 (1914).
Habitat—New South Wales.
On Gidgei (*Acacia cambagei*).

Aspidiotus gowdeyi Newstead.

Aspidiotus gowdeyi Newst., Bul. Ent. Res., iv, 1, p. 77 (1913). Fig.
Gowdey, Bul. Ent. Res., iv. 3, p. 249 (1913).
Habitat—Uganda.
On *Anona muricata.*

Aspidiotus junctilobius Froggatt.

Aspidiotus junctilobius Frogg., Agr. Gaz. N. S. W., xxv, 4, p. 315 (1914) Fig.
Habitat—Southwestern New South Wales.
On yarran (*Exocarpus aphylla*).

Aspidiotus lenticularis Lindinger.

Aspidiotus lenticularis Lindgr., Die Schildläuse, pp. 149, 230 (1912).
Habitat—Denmark.
On ?

Aspidiotus rubribullatus Froggatt.

Aspidiotus (*Aspidiella*) *rubribullata* Frogg., Agr. Gaz. N. S. W., xxv, 4, p. 317 (1914). Fig.
Habitat—West Australia, New South Wales.
On *Eucalyptus.*

Aspidiotus serratus Froggatt.

Aspidiotus serrata Frogg., Agr. Gaz. N. S. W., xxv, 4, p. 318 (1914).
Habitat—New South Wales.
On leaves of Gidgei or Mulga (*Acacia cambagei*).

Aspidiotus tafiranus Lindinger.

Aspidiotus tafiranus Lindgr., Die Schildläuse, p. 229 (1912).
Habitat—Canary Islands.
On *Olea* sp.

Gymnaspis acaciæ Froggatt.

Gymnaspis acaciæ Frogg., Agr. Gaz. N. S. W., xxv, 7, p. 694 (1914). Fig.
Habitat—New South Wales.
On "Weeping Myall" (*Acacia pendula*).

Gymnaspis africana Newstead.

Gymnaspis africana Newst., Bul. Ent. Res., IV, 1, p. 78 (1913). Fig. Gowdey, Bul. Ent. Res., IV, 3, p. 249 (1913).

Habitat—Uganda.

On unknown forest shrub.

Hemiberlesia nitrariæ Marchal.

Aspidiotus (Hemiberlesia) nitrariæ Marchal, Bul. Soc. Zool. France, XXXVI, 45 and 6, p. 150 (1911).

Habitat—South Tunis.

On *Nitraria*.

Hemiberlesia provincialis Vayssiere.

Aspidiotus (Hemiberlesia) provincialis Vayss., Bul. Soc. Ent. Fr., 7, p. 207 (1914).

Habitat—Bouches du Rhone, France.

On Grass (*Ammophila arenaria* (?)).

Odonaspis schizostachyi Cockerell and Robinson.

Odonaspis schizostachyi Ckll. and Robinson, Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 327 (1914). Fig.

Habitat—Philippine Islands.

On climbing bamboo (*Schizostachyum* sp.)

Targionia carolina Froggatt.

Aspidiotus (Targionia) carolinus Frogg., Agr. Gaz. N. S. W., XXV, 2, p. 136 (1914). Fig.

Habitat—New South Wales.

On *Eremophila sturtii* (Myoporineæ).

Targionia laurina Lindinger.

Targionia laurina Lindgr., Die Schildlause, p. 198 (1912).

Habitat—Madeira.

On *Laurus canariensis*.

Pseudotargionia Lindinger n. subg. of *Targionia*. Type, *glandulosa* Newst.

Lindinger, Die Schildläuse, p. 50 (1912).

Aulacaspis manzanitæ Whitney.

Aulacaspis manzanitæ Whitney, Jn. Ent. and Zool., V, 1, p. 50 (1913). Fig.

Habitat—California.

On *Arctostaphylos, Manzanita* sp.

Epidiaspis subterranea Lindinger.

Epidiaspis subterranea Lindgr., Die Schildläuse, p. 174 (1912).

Habitat—France.

On Grass.

Diaspis senegalensis Vayssiere.

Diaspis senegalensis Vayss., Bul. Soc. Ent. Fr., 7, p. 206 (1914). Fig.
Habitat—Senegal.
On leaves of *Khaya senegalensis*.

Diaspis syriaca Lindinger.

Diaspis syriaca Lindgr., Die Schildläuse, p. 264 (1912).
Habitat—Syria.
On *Pistacia vera*.

Diaspis taxicola Vayssiere.

Diaspis taxicola Vayss., Rev. Phytopath. Appliquée, Paris, 1, 9, p. 124 (1913).
Habitat—Algeria.
On *Taxus baccata*.

Phenacaspis mischocarpi Cockerell and Robinson.

Phenacaspis mischocarpi Ckll. and Robinson, Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 328 (1914). Fig.
Habitat—Philippine Islands.
On *Mischocarpus fuscescens*.

Phenacaspis unilateralis Newstead.

Chionaspis unilateralis Newst., Bul. Ent. Res., IV, 1, p. 79 (1913). Fig.
Habitat—Barbados.
On leaves of palm (*Thrinax ?*).

Protodiaspis agrifoliæ Essig.

Protodiaspis agrifoliæ Essig, Jn. Ent. and Zool., VI, 2, p. 76 (1914). Fig.
Habitat—California.
On *Quercus agrifolia*.

Chionaspis austriaca Lindinger.

Chionaspis austriaca Lindgr., Die Schildläuse, p. 252 (1912).
Habitat—Austria (Piesting?).
On *Pinus laricio nigricans*.

Chionaspis nigerensis Vayssiere.

Chionaspis nigerensis Vayss., Bul. Soc. Ent. Fr., 17, p. 368 (1912). Fig.
Vayss., Ann. Service Epiphyties, 1, p. 428 (1913).
Habitat—Upper Senegal—Niger, Africa.
On *Xymenia americana*.

Hemichionaspis uvariæ Cockerell and Robinson.

Hemichionaspis uvariæ Ckll. and Robinson, Bul. Am. Mus. N. H., XXXIII, Art. XXV, p. 330 (1914). Fig.
Habitat—Philippine Islands.
On leaves of *Uvaria* sp.

Lepidosaphes chitinosa Froggatt.

Mytilaspis chitinosa Frogg., Agr. Gaz. N. S. W., XXV, 7, p. 607 (1914). Fig.

Habitat—New South Wales.

On Native Broom (*Templetonia egena*).

Lepidosaphes cortrioides Froggatt.

Mytilaspis cortrioides Frogg., Agr. Gaz. N. S. W., XXV, 7, p. 609 (1914).

Habitat—New South Wales.

On Black Wattle (*Acacia decurrens*).

Lepidosaphes crassa Froggatt.

Mytilaspis crassa Frog., Agr. Gaz. N. S. W., XXV, 7, p. 609 (1914).

Habitat—New South Wales.

On Ti-tree (*Melaleuca* sp.).

Lepidosaphes dispar Vayssiere.

Mytilaspis (*Coccomytilus*) *dispar* Vayss., Rev. Phytopath. Appliquée, Paris, 1, 9, p. 124 (1913).

Vayss., Bul. Soc. Ent. Fr., 7, p. 208 (1914).

Habitat—Madagascar.

On Manihot.

Lepidosaphes eucalypti Froggatt.

Mytilaspis eucalypti Frogg., Agr. Gaz. N. S. W., XXV, 7, p. 610 (1914) Fig.

Habitat—New South Wales.

On *Eucalyptus piperita*.

Lepidosaphes juniperi Lindinger.

Lepidosaphes juniperi Lindgr., Die Schildläuse, p. 188 (1912).

Habitat—Turkey in Asia.

On *Juniperus excelsa*.

Lepidosaphes lobulatus Froggatt.

Mytilaspis lobulatus Frogg., Agr. Gaz. N. S. W., XXV, 8, p. 680 (1914). Fig.

Habitat—New South Wales.

On *Casuarina* sp.

Lepidosaphes mulgæ Froggatt.

Mytilaspis mulgæ Frogg., Agr. Gaz. N. S. W., XXV, 8, p. 681 (1914).

Habitat—New South Wales.

On Mulga or Gidgei (*Acacia cambagei*).

Lepidosaphes recurvata Froggatt.

Mytilaspis recurvata Frogg., Agr. Gaz. N. S. W., XXV, 8, p. 683 (1914). Fig.

Habitat—New South Wales.

On Black Wattle (*Acacia decurrens*).

Genus **PARLATOREOPSIS** Lindinger. Type, **longispina** Newst.
Lindinger, Die Schildläusse, p. 191 (1912).

Pseudoparlatoria argentata Hempel.

Pseudoparlatoria argentata Hemp., Cat. Faun. Brazil, III, S. Paulo, pp. 51, 63 (1912).

Habitat—S. Paulo, Brazil.

On *Aglaia* sp.

DIPTEROLOGICAL MISCELLANY.

By Frederick Knab, *Bureau of Entomology.*

EVOLUTION OF THE BLOOD-SUCKING HABIT IN SYMPHOROMYIA.

In several families of Diptera the blood-sucking habit is unequally developed in different species. Thus, in the Culicidæ we have within the same genus species that are aggressive blood-suckers, others that apparently have but a weak craving for blood, and still others that do not bite at all. Similar conditions appear to obtain in the chironomid subfamily Ceratopogoninæ, while in the family Psychodidæ the blood-sucking habit is restricted to the genus *Phlebotomus*.

The leptid genus *Symphoromyia* has been reported as a blood-sucker several times, but, as its chief habitat is in the comparatively unsettled Rocky Mountain region, we have very little exact information on the habits of the different species. Prof. J. M. Aldrich, who has recently revised the genus, informs me that two species appear to be the principal biters and that he has only a single record for a third species. These data will appear in a paper which Prof. Aldrich now has in press. Some additional information has recently come to hand and the indications are that certain species of *Symphoromyia* are aggressive biters, while others are in process of acquiring the blood-sucking habit. Of course, it is possible that some of the inoffensive species feed upon animals other than man and the large mammals. A specimen and note recently sent in by W. H. Boyd of Cottonwood, British Columbia, adds a fourth species, *Symphoromyia pachyceras* Will., to the list of blood-suckers. The interesting part of the note is that it appears to show that this species is in a transition state. Mr. Boyd says that this species "bites for itself on unprotected portions of animals, but seems to prefer to take the blood oozing from a bite left by the larger fly" (*Tabanus*).

It must, however, be remembered that the species of *Symphoromyia* are all similar in appearance and that the individuals lapping the blood from wounds may belong to different species

from those that actually bite. The case reminds one forcibly of the condition found by Captains Patton and Cragg among certain forms of Muscidæ in India.[1] It may be added that a specimen of *Symphoromyia pachyceras* (det. Aldrich) in the National collection, taken by H. S. Barber at Williams, Arizona, bears the label "biting." Recently the same species has been reported as biting by Dr. J. C. Bradley.[2] The specimens identified by the writer as *pachyceras* in a previous paper,[3] have been placed by Prof. Aldrich in the course of his revisional work under *S. hirta* Johnson.

MUSCA LEPRÆ LINNÉ.

Under the name *Musca lepræ* the following appears on page 598 of the tenth edition of the Systema Naturæ:

M. antennis setariis atra nitens, antennis pedibusque albis, oculis rufo inauratis.

Habitat in *Elephantiasi* Nigritum Americæ. Rolander. Corpus pediculo minus. Abdomen subtus & basi album. Denticulus utrinque ad basin proboscidis.

The description is quite unrecognizable. Later Wiedemann described a small fly under the name *Chlorops lepræ*, but expressed doubt as to its identity with the species described by Linnæus.[4] Becker has recently identified the specimen on which Wiedemann based his description as a species of *Hippelates*.[5] He also questions its identity with the Linnean species, but retains the specific name on the ground that it has been removed to a different genus.

For medical entomology the identity of the Linnean species is a question of considerable interest. No taxonomic data appear in the original description that could serve for accurate identification, but the identity of the fly might be established with the aid of the other data by one favorably situated. Linnæus evidently intended to indicate that the larvæ of the fly occurred in cases of elephantiasis and is so interpreted by Wiedemann.

[1] Patton, W. S., and F. W. Cragg. On certain hæmatophagous species of the genus Musca, with descriptions of two new species. Indian Journ. Med. Research, vol. 1, no. 1, p. 11–25; 1913.

[2] Riley, Wm. A., and O. A. Johannsen. Handbook of Medical Entomology, 1915, p. 112.

[3] Knab, Frederick, and R. A. Cooley. Symphoromyia as a blood-sucker. Proc. Ent. Soc. Wash., vol. 14, p. 161–162; 1912.

[4] Aussereurop. zweifl. Ins., vol. 2, p. 598 (1830).

[5] Ann. Mus. Nat. Hung., vol. 10, p. 172 (1912).

Presumably the larvæ occur in lesions in advanced cases of elephantiasis and the fly is to be sought for among the scavenger forms. The body of the fly is said to be less than that of a louse. Among such small forms of scavenger habits the group that naturally suggests itself is the Phoridæ. They are common in the tropics and infest all sorts of organic substances, from dead insects and molluscs to human fæces, one species being known even to invade the human cloaca.[1] In a suitable locality, such as some of the West Indian islands where elephantiasis is common, it would be easy, no doubt, to rediscover the fly.

A CASE OF PHORESY.

A few years ago Mr. Nathan Banks gave a review of the literature treating of insects being transported by other species.[2] Many of the observed cases have been Borboridæ transported by dung beetles, the flies evidently employing this method to reach suitable breeding places. The habit appears to be a fixed one in certain species and one species, *Limosina sacra*, has received its specific name on account of its association with the sacred beetle, *Ateuchus sacer*. While the habit has been observed repeatedly in the warmer parts of the Old World, there is but one record for America and in that case the flies were not identified.[3] Mr. W. D. Pierce has handed me several specimens of Borboridæ which he captured recently (October 15, 1914) at Madison, Florida, while they were riding on the dung beetle, *Canthon viridis*. He tells me there were over twenty of the flies on and hovering about the beetle. The flies proved to belong to two very distinct species, a small one with milk-white wings and a larger one with smoky wings. The former proved to belong to the genus *Borborus* and is probably an undescribed species; probably it is the same one observed by Moulton in Missouri, for he particularly mentions the white wings of the flies The specimens of the second species taken by Mr. Pierce were unfortunately destroyed by an accident, but probably were also a species of the genus *Borborus*.

Under the heading of Notes and Exhibition of Specimens, the following was presented by the author who also exhibited specimens and drawings of the flies under consideration:

[1] Austen, Trans. Soc. Trop. Med. and Hyg., vol. 3, p. 229–232 (1910). Laurence, Brit. Med. Journ., vol. 2 for 1910, p. 376.

[2] Cases of phoresie. Entom. News, vol. 22, pp. 194–197 (1911).

[3] Moulton, J. T., Flies riding on tumble-dung. Amer. Ent., vol. 3, p. 226 (1880).

NOTE ON THE SPALLANZANIINE FLIES.

(AUTHOR'S ABSTRACT.)

By C. H. T. Townsend, *Bureau of Entomology.*

The two species *Pseudogonia ruficauda* Townsend (1892) and *Cnephalomyia floridana* Townsend (1912) are so similar in the adult as to be indistinguishable until one has learned the very slight but constant differences that separate them. Their eggs and first-stage maggots are greatly contrasted, though both belong to the microtype-egg stocks. They represent distinct genera, and the former will become the type of a new genus. They are evidently cases of convergent evolution in the adult, in conjunction with divergent evolution in the early stages, indicated not only by the egg and first-stage maggot characters but also by the character of the slight external differences of the fly, and have traveled separate paths of development from distinct origins within the *Spallanzania* group, though no doubt of ancient common origin. On external characters alone, one would unhesitatingly refer both to the same genus, and a nice discrimination is required to satisfy oneself that they are not the same species. This is a notable case of the early-stage characters constituting an index to the value of the external adult characters. Full details will be published in due time, including synopses based on adult characters. From Williston's description and two figures of the head, it appears that *Acroglossa hesperidarum* Williston does not belong in the *Spallanzania* group, and that a mistake has been made in labeling the type specimen of that species.

Two Hundred and Eighty-First Meeting,

December 3, 1914.

The 281st regular meeting of the Society was entertained by Mr. W. D. Hunter in the Sængerbund Hall, December 3, 1914. There were present Messrs. Abbott, Baker, Barber, Böving, Busck, Caudell, Coad, Crawford, Cushman, Duckett, Ely, Gahan, Greene, Heidemann, Heinrich, Hunter, Hutchinson, Isely, Knab, Kotinsky, McIndoo, Middleton, Parker, Popenoe, Rohwer, Rust, Sanford, Schwarz, Shannon, Simanton, Townsend, Van Dine, Walton, Webb, White and Wood, members, and Messrs. John E. Dudley, Jr., G. L. Garrison, H. G. Ingerson, R. W. Morland and Mitchell Phillips, visitors.

Mr. E. W. Rust and Mr. Dwight Isely were elected to active membership and Mr. A. F. Satterthwaite to corresponding membership.

The following officers were elected for the ensuing year: President, Mr. A. N. Caudell; 1st Vice-president, Mr. C. R. Ely; 2nd Vice-president, Mr. E. R. Sasscer; Corresponding Secretary-Treasurer, Mr. S. A. Rohwer; Recording Secretary, Mr. A. B. Gahan; Editor, Mr. J. C. Crawford; additional members of the Executive Committee, Mr. Schwarz, Mr. Quaintance and Mr. Marlatt.

To represent the Society as a Vice-president of the Washington Academy of Science, Mr. W. D. Hunter.

The following papers were read:

ON THE OCCURRENCE OF AN INTERMEDIATE IN APHIS POMI DeGEER.

(With Plate X)

By W. F. Turner and A. C. Baker.

The family Aphididæ presents many problems for the attention of the student of bionomics which are presented by no other similar group of insects. This, for the reason that the majority of the insects composing this group confine their feeding to definite host plants; that many of them cannot, or at least, ordinarily do not complete a year's cycle without the aid of two different species, and usually genera or even families of host plants; that several distinct forms of adults occur during one year's cycle; and finally that two or even three modes of reproduction may occur in the same period.

In the present paper we are concerned only with the last two items. In general, the adult forms may be classified in one of the following groups: First, the stem-mother, which hatches from a hibernating egg, or less often, is born in the fall and itself hibernates. It is parthenogenetic and may produce either living young or eggs. Second, the summer forms, either alate or apterous. Here any one of a variety of conditions may exist. The alate forms may occur promiscuously throughout the summer, or they may be confined to certain generations. In the latter event they may occupy those generations in which they occur to the exclusion of the apterous form, or may share the gener-

ation, in which case we have two very different forms, sisters or at least cousins, whose purpose in the economy of the insect may be as widely separated as their forms. Like the stem-mother these forms are parthenogenetic and like them, again, they may be viviparous or oviparous. This group may comprise from one to twenty or more generations. Finally there occur the sexes; females mate with males and produce eggs.

The matter is further complicated by the fact that there are countless variations of these general types, usually evolved in conjunction with some peculiar mode of life in a particular species, or group of species, or occurring in order to aid certain species to pass through adverse climatic conditions occurring during the year's cycle; for example, certain subterranean and gall inhabiting forms, and the flabellate form of *Chaitophorus testudinatus* Thornton, in which stage the insect passes through the warmer period. However, these different forms may be further combined into two groups, alate and apterous if the general form be the standard, or parthenogenetic and sexual when classified according to the mode of reproduction. To confuse matters still further, several observers have recorded, during the past thirty-five or forty years, adult forms which hold an intermediate position between the two groups, whichever classification be used.

What appears to be the earliest record of such an intermediate form is that made by Fatio (1876) in *Ph. vastatrix*. He speaks of a "pupa" which deposited (sessuali) eggs on the roots. This pupa was undoubtedly an intermediate. Maxitz (1893) describes two anomalous "pupæ" in this species, which in general resembled true pupæ, but had only foldings of the skin to represent wing pads. He believed these to be fully matured individuals, not pupæ arrested in development but intermediates between the apterous root form and the pupa. In this same species Stauffacher in 1907 noted observations on "pupæ" which possessed the "corsaletto" found usually only in the alate insects. In 1908 and again in 1912, Grassi and Foa recorded observations on intermediates, accompanied by quite detailed descriptions of several specimens, or groups of specimens. They state that their observed forms can be arranged in a series from apterous to alate. All of these intermediates with one exception, were virginoparæ, the one exception being a sexupara.

In other *Phylloxera* Dreyfus (1889) described intermediates (calling them apterous) in *coccinea* Drey. *punctata* Licht., and *rutila* Drey. He states that he observed apterous sexuparæ with eyes composed as in the alate, or better as in their pupæ and with all three ocelli present. He also observed in *rutila*, "pupæ" with the "corsaletto" later found by Stauffacher in *vastatrix*, as already recorded.

Grassi Foa (1908) also found intermediate sexuparæ in *Ph. Danesii*.

Among other aphids, Nüsslin observed the normal occurrence of intermediate sexuparæ in *Mindarus*. Mordwilko described intermediates in *Tetraneura cærulescens* with antennæ of six segments and compound eyes of 6–10 facets in one form, and well developed compound eyes in another, neither having any trace of wings. In *Dryobius roborsis* he describes a viviparous female with rudimentary wings and the dorso-ventral (alary) muscles and the longitudinal muscles of the thorax rudimentary or degenerated. He did not observe the offspring of this form.

Börner (1908) found these forms in various species of the Chermesidæ. He failed to observe the offspring, but apparently considers the adults as virginoparæ.

In so far as observations on the offspring were noted these records may be divided into groups. It will be noted that all of these observations have been made in species with very specialized life cycles, and that this form occurred in the generation in which sexuparæ also occurred. All the forms observed in Chermesidæ by Börner, and with one exception, all those observed in *Ph. vastatrix* by Grassi and Foa, were virginoparæ, that is, forms producing a large number of eggs which give rise to parthenogenetic aphids. These virginoparæ are normally all apterous at this time of year. The remaining records state that the adults were sexuparæ. The majority of the sexuparæ in the species under observation are alate, but apterous forms have been described in most, if not all of them. These conditions have given rise to various theories, which attempt to explain them.

Balbiani appears to have been the first to discover apterous sexuparæ (in *Paraphyl'oxera glabra*). He believed that these insects were alates in which sexual maturity preceded full somatic development, in other words, that while sexually mature, the insects were still in the larval form. Dreyfus believed that his observations of intermediates confirmed this theory. Börner considered that the apterous and intermediate sexuparæ of these two writers had the same value as his intermediates (which were viginoparæ). He believed, however, that they were merely intermediates between the normal virginoparæ and sexuparæ and were fully mature individuals. Mordwilko interpreted his intermediates in *Tetraneura cærulescens* in like manner.

Later (1909) Börner stated that, contrary to the theories of Balbiani and Dreyfus, intermediates are not larvæ, since they pass through four moults and attain, with the exception of wings, the more important alate characters. However, he makes a fundamental distinction between the intermediate virginoparæ of the

Chermesinæ and of *Ph. vastatrix*, and the intermediate sexuparæ of the other *Phylloxera*. The first he classes simply as abnormalities, forms intermediate between types with diverse modes of reproduction, while the second would constitute a type to themselves, a true wingless form of sexuparæ, or one with the wings reduced.

Dr. Foa fails to agree with Börner, first, because there exist in certain forms, alate virginoparæ and one would suppose that the intermediate virginoparæ would group with these, like the sexuparæ with the alate sexuparæ; secondly, because the separation between virginoparæ and sexuparæ is not absolute, from the fact that some nymphs can become virginopara or sexupara, because virginosexuparous forms exist. She further states that if the intermediate forms of the grape *Phylloxera* were found mostly in the spring, one should admit that they represent a series of alate virginoparæ in the process of reduction, but having been recovered only in the time and place in which the pupæ of alate sexuparæ exist, one would be led to believe that they are allied to them. She believes that, for unknown reasons, the *Phylloxera* is able to change its destiny in different stages of its development and that if it should change it in the first or second stage it would still produce a normal individual, while if it determines itself in the fourth it will probably become an intermediate. The intermediate virginoparæ, therefore, would be considered as individuals, which, as far as the third stage were going to become apterous adults. At this point, however, there would come some change, which, while having an influence on the character of the individual, would not be able to modify the nature of the eggs, since this would probably have been already fixed. The intermediate sexuparæ would be, instead, individuals which were to become alate, which had changed their orientation in the third stage, when the nature of the eggs was already determined.

Dr. Foa appears to be the only worker who has recorded observations on the younger stages of these intermediates. She says that the last nymphal stage of this form, more or less resembles a pupa. She observed the moulting of two individuals. One of these, when adult, had wing rudiments slightly larger than the pupal pads, while in the second they were smaller.

During the past summer, in the course of a study of the life history of the green apple aphis (*Aphis pomi*, DeGeer), at Vienna, Virginia, we made numerous observations on an intermediate form. The insects were reared on small seedling apple trees, in pots, each plant being covered by a lantern globe cage. Alate forms were of very frequent occurrence during the summer and,

in so far as it was possible, we bred the progeny from alate and apterous mothers in all cases. This necessitated the handling of a large number of experiments, there being at some periods as many as two hundred and fifty running simultaneously. It was found to be impracticable, under these circumstances, to select only the first and last born to represent each generation, as appears to be the usual custom. Consequently, we allowed two sisters, or cousins, as the case might be, in one generation, to produce the next and reared from a few to as many as sixty insects to maturity in every case, selecting our mothers for the next generation when they had reached the adult stage. This method has one great advantage over the other, in that it provides an abundance of bred material for further study.

In these experiments we obtained an adult form quite distinct from any of the normal adults of the species. This adult was an intermediate between the alate and apterous vivipara, or rather it is an alate with a tendency to degenerate to the apterous condition.

In the fourth or last nymphal instar, aphids which will become alate are strongly differentiated from the earlier stages and from the corresponding stage of the apterous form (fig. *m*). The thoracic segments are more clearly differentiated from each other and from the abdomen. The prothorax is narrow with nearly straight margins, while the proximal angles of the mesothorax form two prominent, rounded shoulders. The entire body is more narrow and elongated. The meso- and metathorax bear large wing pads. The color also varies in this form, the head and thorax being orange yellow with a rosy bloom, while in apterous insects they are yellow-green, concolorous with the abdomen. The wing pads are dark gray in color. Because of its resemblance to that form in the metabola, we follow the general custom and call this stage a pupa. It should be stated, in this connection, that the possession of wing pads also pertains to the third nymphal instar of this form, but in this case they are very small and their presence is not accompanied by any of the other special characters noted.

The fourth nymphal instar of this intermediate is apparently identical with the pupa of the normal alate aphid. The measurements of the antennal segments, the cornicles and the posterior tibiæ are the same for both. In one case of five pupal moults mounted on a single slide, four being from insects which became normal alates and one from an intermediate, we were unable to separate the moults from each other. In handling the insects we usually transferred the "potential" alates to new plants, in the pupal stage. In no case of the selection and transfer of these

pupæ did we have any suspicion that they would prove to be anything but normal alate insects. Yet in several cases the adults were intermediate.

Upon becoming adult, however, the intermediate, at a casual glance, appeared to be apterous. In fact, it required close examination with a hand lens to perceive that it was not. The darker color of the head and thorax was lost, and instead of being black, as in the normal alate, it was of a uniform green with the abdomen, as in the apterous forms. Moreover, the shoulder of the mesothorax tended to flatten out, approaching the more uniform line of the apterous adult.

In the true alates, the wing venation was found to grade from the most complete nearly to the most reduced type known in aphids. (Exception should be made of one or two species recently described in which all veins, except those forming the stigma have been eliminated) (figs. *b–d*). The great majority possessed the most complete type, while only a small minority had the more specialized venation. The wings of intermediates which approached most nearly to the alate conditions were provided with even fewer veins, if they could be called such, than were any of the normal alate insects (fig. *e*). They were usually smaller than the wing pads of the pupæ, approximating the pads of third instar. This character varied greatly, however, forming with the character of the venation, a nicely graded series between the alate and apterous condition (figs. *f–k*).

It is to be expected, if the wing condition of these intermediates were a true reduction and not a mere accidental abortion, that it would be accompanied by a corresponding degeneration in the alary muscles. Such is found to be the case. In all of the specimens figured in the plate both pairs of dorso-ventral and longitudinal muscles were reduced nearly to the apterous condition. In specimen No. 1041, the form most nearly approaching the alate in wing condition, the large dorso-ventral muscles were reduced but little. In No. 910, which closely approximates the apterous form, these muscles were found to be almost exactly as in the apterous condition. In the intervening forms they were reduced almost to the apterous condition, being slightly larger in No. 999 than in the others.

While the antennal measurements vary considerably in the intermediate form, there is no appreciable difference in the average measurements of three adult types, nor does there appear to be a greater variation within the intermediate than is found within the apterous and alate forms. This is true, also, of the measurements of the cornicles and posterior tibiæ.

The variation in one antennal character, however, well shows the intermediate condition of our new form. No sensoria are

present on the third antennal segment, in apterous adults (fig. *r*), while in the alate insects this segment bears from four to eight of these sensoria, both the average and the mean being six (fig. *n*). These sensoria are large and generally of uniform size. Moreover, in the vast majority of cases, the numbers on the two antennæ are equal. In nine intermediates, this segment bore from four to six sensoria, the average being slightly under five per antenna and the mean, four. In seven out of the nine cases the numbers on the two antennæ were not equal. Moreover, these sensoria were very unequal in size. In some cases they were all large, though never as large as in alate insects, in some small, while in still others they varied greatly in size, the distribution of the small ones also varying (figs. *o*–*q*).

This form occurred in sixteen different experiments with a known total of thirty individuals. The first occurrence was in the third generation, on May 29, and the last in the twelfth generation, on August 26. It occurred in at least one experiment in all of the intervening generations, with the exception of the fourth and ninth. Of these sixteen lots, thirteen were produced by apterous mothers and three by alate. In only two cases did intermediates occur without the presence of alate sisters.

Eleven of these series reproduced normally, the other five dying before reproduction took place. All eleven series produced apterous offspring and three of them also produced alate forms. In two cases single individuals brought forth progeny, some of which became apterous and some alate. This polymorphic reproduction is of quite common occurrence in this species among both alate and apterous mothers. All of the young were perfectly normal and in several cases we were able to carry the descendants through several generations (in the case of the earliest through thirteen) to the sexual forms.

In 1912 Webster and Phillips recorded the occurrence of a similar form produced under similar conditions in *Toxoptera graminum*, a species in which, also, the majority of the summer form are apterous, but in which alate individuals occur quite frequently. They stated that they observed one instance in which a puparium produced six young. Apparently they did not rear these young. The note continues. "The cauda of this individual resembled that of an adult insect and the wing pads were aborted, the abdomen being much broader than that of the normal pupa."

Through the kindness of Professor Webster, we have since examined this specimen (mounted on a slide) and find it to correspond, as far as reduction is concerned almost exactly to our intermediate. The wing muscles are very much reduced;

the cauda is that of the adult form; and the antennæ are armed with sensoria as are the alate adults, there being four on the right and two on the left.

We have also noted an intermediate in *Aphis rumicis*, corresponding closely to that in *A. pomi*, and in a species of *Phylloxera* on hickory we have observed one specimen with wings about half the normal size.

Hunter (1909) and again Webster and Phillips have described forms in *T. graminum*, which vary between the sexual and parthenogenetic females. Some of these vary in outward form, between the true female and the alate agamic female; others between the true female and the apterous agamic. Some contain only eggs, others produce both eggs and living young.

We believe that all of these intermediates are of like value with that which we have found in *A. pomi*, that is, they all developed toward the alate condition until the end of the third instar, during which stage the pupal form is determined. In the fourth, or pupal instar, however, they tended to progress to the apterous condition. We find no evidence to support Dr. Foa's contention that insects primarily designed to become apterous may later tend to become alate, nor can we agree with Börner in his classification of these intermediate forms. The only condition which necessitates such explanations is that in which the intermediates are virginopara, while normal virginopara are apterous. Has not too much stress been laid upon this distinction between virginoparæ and sexuparæ? Dr. Foa, herself, states that she has observed virgino-sexuparæ, which would indicate that the line of demarcation is not strictly drawn, and other authors appear to believe that the intermediate virginoparæ are intermediate in position between virginoparæ and sexuparæ.

It is generally accepted that the apterous aphid is a more specialized type, which has been derived from the alate. If this is true, it would seem that the tendency in aphids is to eliminate the wings. At the same time, there would appear a degeneration of secondary alate characters, such as the sensoria on the third antennal segment, in species like *A. pomi*. In support of this theory attention is called to the fact that in *A. pomi* we have been able to breed the insects from the egg stage to the egg stage without the intervention of any alate generations.

Moreover, the primitive aphids must have been oviparous insects, reproducing sexually. Variations from this type would be the tendency to eliminate males and to transform from ovipara to vivipara. In some species these variations have been followed to their logical conclusions with the apparent elimination of both males and oviparous reproduction. In other cases this has been

partially accomplished, in that, under the proper climatic conditions, males and eggs do not appear in certain species while in colonies of the same species living under other conditions they do occur.

Granting the above premises, we believe that in these intermediates we have to do solely with transitional forms between more primitive conditions on one hand and more advanced conditions on the other. We feel confident also, that all these intermediates are of equal value. The very fact that variants have been discovered in so many different species, having such diverse habits, seems to us to preclude the possibility that these arise from different fundamental causes. The only difference is that the forms in *A. pomi* and similar species and the intermediate sexuparæ of various *Phylloxera* are varying in one characteristic, the elimination of wings, while the virginoparous forms in *Ph. vastatrix* and in the Chermesinæ are varying in two characters; the elimination of wings and the elimination of sexes. The intermediates described by Hunter and by Webster and Phillips fall into at least two classes, the elimination of wings and the elimination of ovipara. Some of the forms are intermediate in both groups, some only in one. It is possible, also, that there is here, a variation between sexual and parthenogenetic reproduction, but as the offspring were not reared this point cannot be determined.

We feel confident that, in the final analysis, these forms are not the result of promiscuous variations, but of deviations along definite lines, which are uniform for the entire family; that changes in outward form are always from alate to apterous; and that variations in the mode of reproduction progress from sexual to parthenogenetic and from oviparous to viviparous.

If we are correct in this matter then we are dealing with a group of insects which are at present in an unstable condition and in the various intermediates we are observing the steps by which the more advanced conditions are attained.

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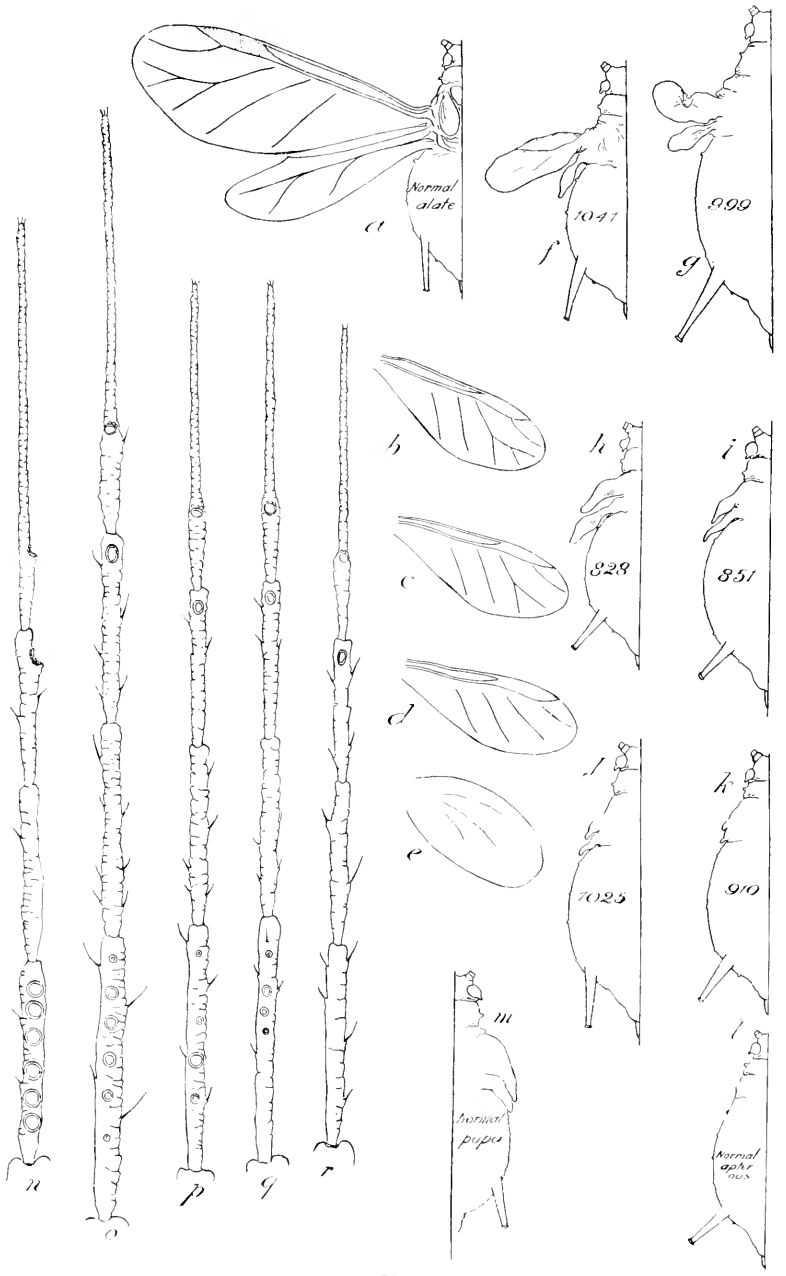
EXPLANATION OF PLATE X.

Fig. A, Normal alate.
Figs. B-D, Variation in venation in alate wings.
Fig. E, Intermediate wing; greatest development.
Figs. F–K, Intermediates, showing series between alate and apterous condition.
Fig. L, Normal apterous.
Fig. M, Normal pupa.
Fig. N, Antenna of normal alate, showing sensoria on third segment.
Figs. O–Q, Antennæ of intermediates, showing degeneration of sensoria.
Fig. R, Antenna of normal apterous aphid, showing absence of sensoria on third segment.

Mr. Barber objected to the term "adults" being assigned indiscriminately to the reproductive stages of the aphids by Messrs. Baker and Turner. He believes that the aphids should be looked upon as reproducing more through an extreme form of pædogenesis than as simply agamic females, but that it is very hard to draw a line between simple parthenogenesis and its more complex type that is called pædogenesis. He believes that the term "adult" is more strictly applicable to forms in which less divergence is found from the normal bisexual mode of reproduction. This normal sexual reproduction is impossible in the so-called agamic "adults" of the aphids which might be regarded as larvæ so similar in structure throughout all their stages to the true adults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as to be even capable of acquiring wings, an idea which he had previously suggested before the Society (Proc. Ent. Soc. Wash., vol. 15, p. 35). He is not sufficiently familiar with the literature on the aphids to cite references on this point, but in a verbal discussion with Dr. Wm. M. Wheeler he received the impression that the present accepted explanation of the viviparous reproduction of the aphids is on the line pf pædogenesis.

THE FAMILY ŒSTROPHASIIDAE AND OTHER NOTES.

(AUTHOR'S ABSTRACT.)

By C. H. T. Townsend, *Bureau of Entomology.*

The family divides into the subfamily Ormiinæ, which equals the family Phasiopterygidæ Townsend (1912); and the subfamily Œstrophasinæ, the latter evidently including *Phasiops* Coquillett as judged on adult characters. The former subfamily possesses eggs which are microtype at time of fertilization but develop in utero to macrotype and disclose in utero a highly specialized planidium type of maggot indicating most likely a parasitism on ant or wasp pupæ, the maggots of *Ormia* possessing heavy strongly-hooked talons on the ventral aspect of the second segment. *Œstrophasia* has recently been demonstrated to deposit a microtype egg of a distinct character from any hitherto known, indicating noncommunity of origin with the masiceratid stocks. Its maggot is also of distinct character from the masiceratid maggot, and while greatly contrasted with the ormiine maggot is evidently of common family origin therewith. Three genera are so far known in each of the two subfamilies, *Phasiopteryx australis* Townsend (1912) becoming the type of a new genus. Adult characters mark this family off conspicuously from the rest of the Muscoidea, and they are well supported by the reproductive and early-stage characters. The family is evidently an ancient one, with a remnant persisting exclusively in America and no close existing relatives. The most nearly related group known appears to be the tribe Myiophasiini, but it is much too far removed on adult and all other characters from the Œstrophasiidæ to be included therein. The family name Œstrophasiidæ was proposed by Brauer and von Bergenstamm in 1889. Full details, including adult-character synopses, will be published later.

The European *Winthemia quadripustulata* Fabricius does not occur in America, the American forms being easily separated as

distinct, among which are thus far recognized *militaris* Walsh, *deilephilæ* Osten-Sacken and *datanæ* Townsend. The original descriptions closely followed will separate these species. *Spallanzania hebes* Fallen and *Cnephalia bucephala* Meigen do not occur in America; the species *finitima* Snow being congeneric with *ruficauda* Townsend, while *pansa* Snow is a distinct American species of *Spallanzania* as opposed to *Cnephalia*. Furthermore *Gonia capitata* DeGeer is not American, *frontosa* Say being valid, as well as several other easily separable American species.

The following papers have been accepted for publication:

NOTES ON IPIDÆ WITH DESCRIPTION OF A NEW SPECIES.

By A. D. Hopkins.[1]

A subdivision of the genus *Ips* DeGeer represented by *Ips* (*Tomicus*) *concinnus* Mann. is distinguished from the other divisions by the subcompressed antennal club with the basal joint short and with two broadly procurved annulations on the anterior face. The elytral striæ faintly or not at all impressed and the punctures not or but slightly coarser than those of the interspaces; the declivity steep, concave and with three marginal teeth each side, the third cylindrical and prominent. The marginal teeth are coarser in the male than in the female.

There are three species distinguished as follows:

b1. Pronotal and elytral punctures fine.

[Oregon to Alaska, in *Picea sitchensis*.]

concinnus Mann.

b2. Pronotal and elytral punctures moderately coarse.

Elytra with striæ punctures not distinctly coarser than those of the interspaces.

[Berkeley, California, in *Pinus radiata*, Apr. 18, 99, Hopkins collector, Hopk. U. S. No. 3c. Type No. 7461 U. S. N. M. California to Idaho, in *Pinus radiata* and *Pinus contorta*.]

radiatæ n. sp.

Elytra with striæ faintly impressed and the punctures coarser than those of the interspaces.

[Mexico, in *Pinus*.]

mexicanus Hopk.

(Proc. Ent. Soc. Wash., Vol. V, No. 1, 1902, p. 75.)

[1] This is a contribution from the Bureau of Entomology, Branch of Forest Insects.

DESCRIPTIONS OF BRACONIDÆ

By S. A. Rohwer, *Branch of Forest Insects, Bureau of Entomology*

Genus Allodorus Foerster.

This genus, which has not heretofore been recorded in the Nearctic fauna, may be separated from *Triaspis* Haliday by the presence of at least a stump of the cross vein in the anal cell, by having the fourth and fifth tergites narrowly visible, and by the more or less convex venter. (In *Triaspis* the venter is concave.)

Characters Common to the Nearctic Species.

Black; legs ferruginous except the brownish posterior tibiæ and tarsi; wings hyaline, venation dark brown or black; front shining, sparsely punctured; mesoscutum and meso-prescutum shining, sparsely punctured; notauli foveolate; the base of the propodeum with two shining areas; posterior face irregularly reticulate; the depressed area between the mesoscutum and scutellum with a strong median carina; mesepisternum shining, sparsely punctured; depression before the carina between the mesepisternum and the mesepimeron foveolate; third antennal joint a little shorter than the second; ocelli in a little less than an equilateral triangle; the postocellar line much shorter than the ocellocular line; ovipositor about the length of the abdomen.

Table to the Nearctic Species

Face shining, very sparsely punctured; supraclypeal foveæ shallow; clypeal suture uniformly strong; the striæ of the third tergite straight, parallel and covering the entire surface ..... *fiskei* (Rohwer)

Face more closely punctured laterally and more or less rugulose medially; supraclypeal foveæ strong; clypeal suture poorly defined medially; striæ of the third tergite oblique laterally, and more or less concentric apically with a median area which is usually nearly transversely striate ..... *tomoxiæ* Rohwer

Allodorus fiskei (Rohwer). *Triaspis fiskei* Rohwer, Proc. U. S. Nat. Mus. Vol. 45, No. 1991, 1913, p. 535.

Allodorus tomoxiæ new species. Length 4.5 mm. for both sexes. The female agrees with the above mentioned characters. The males have the head slightly paler than the females often having the face entirely reddish yellow; otherwise they agree with the females.

Falls Church, Virginia. Described from three females (one type) and three males (one allotype) recorded under Bureau of Entomology number Hopk. U. S. No. 10122, which refers to note stating that this species is parasitic on the larvæ of *Tomoxia lineella* feeding in brashy wood of *Liriodendron* stumps. Material collected and reared June 22, 1912, by S. A. Rohwer.

Type: Cat. No. 19096, U. S. N. M.

Genus Neophylax Ashmead.

This genus belongs to the Agathinæ as defined by both Ashmead and Szepligeti. In Szepligeti's table to the genera of the Agathinæ it runs to the genus *Megagathis* Kriechbaumer but differs from the description of that genus in having the depression above the antennæ with a margining carina and in having the second segment without any sutures.

Neophylax snyderi Ashmead. *Female:* Length 7 mm. Ferruginous; antennæ, extreme apices of the posterior tibiæ and the posterior tarsi, black; wings hyaline, slightly dusky, venation yellowish; costa and stigma black. Prescutum defined by foveolate furrows; depression between the scutum and the scutellum with three longitudinal rugæ; the dorsal and posterior aspects of the propodeum separated by a sharp carina, the dorsal aspect with four longitudinal carinæ which define three rectangular areas, the median one narrower than the lateral ones, the posterior aspect with five rectangular areas the median one slightly broader, dorsally; abdomen shining, second tergite nearly as long as the first.

Luebo, Congo. Described from one female collected by T. W. Snyder.

Type: Cat. No. 14162, U. S. N. M.

Macrocentrus ægeriæ, new species. Of the described species this is more nearly allied to *mellipes* Provancher, but may be distinguished from that species by the sculpture of the prescutum.

Female: Length 8 mm.; length of the ovipositor 8.75 mm.; length of the antennæ 9.5 mm. Anterior margin of the clypeus broadly, gently, arcuately emarginate; head below the antennæ shining, with sparse, widely separated punctures which become closer in the median area, above the antennæ; posterior orbits shining, practically impunctate, except for the setigerous punctures; postocellar line about one-sixth shorter than the ocellocular line; scutum and prescutum shining, the scutum medially with a few large punctures; notauli well defined, foveolate, reticulate where they meet; scutellum shining, with a few distinct setigerous punctures; depressed area between the scutum and scutellum with eleven strong rugæ; propodeum transversely irregularly striate, anteriorly the striations are finer and there is a tendency towards reticulation; mesepisternum shining with uniform, widely separated distinct punctures; first and second tergites with longitudinal striæ; on the first the striæ form an elliptical-shaped median area; the third and following tergites practically impunctate; second abscissa of the radius but little shorter than the first transverse cubitus; nervulus post-furcal by half its length. Black; palpi and tegulæ brownish; mesosternum, lower part of the mesepisternum, spot on the mesepisternum and legs except the posterior tibiæ and tarsi, rufous; the apices of the four anterior legs paler; the posterior tibiæ and tarsi brownish black; a narrow pallid band at the base of the tibiæ; wings hyaline, iridescent, venation brownish.

Greenville, South Carolina. Described from one female recorded under Bureau of Entomology number Hopk. U. S. No. 11128*a*, material reared May 5, 1913, by Carl Heinrich. This species is parasitic on the larva of (*Sesia*) *Ægeria castaneæ* Busck.

Type: Cat. No. 19085, U. S. N. M.

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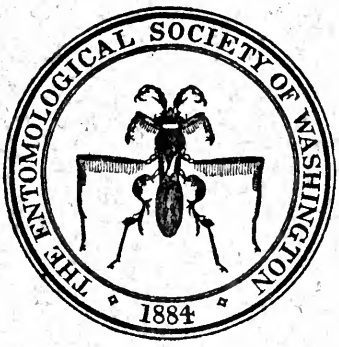

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVII 1915 No. 2

Two Hundred and Eighty-Second Meeting,

January 7, 1915.

The 282d regular meeting of the Society was entertained by Prof. A. L. Quaintance at the Sængerbund Hall, January 7, 1915. There were present 48 members and 21 visitors, this being the largest attendance ever recorded at a regular meeting. Those present were Messrs. Abbott, Baker, Barber, Bishopp, Blakeslee, Böving, Busck, Caudell, Champion, Coad, Craighead, Crawford, Cushman, DeGryse, Van Dine, Ely, Fisher, Gahan, Gill, Greene, Heinrich, Hood, Hopkins, Howard, Hunter, Hutchinson, Isely, Kelly, Knab, Kotinsky, McIndoo, Middleton, Phillips, Pierce, Quaintance, Ransom, Rohwer, Rust, Sanford, Schwarz, Shannon, Siegler, Simanton, Snyder, Strauss, Townsend, Turner, Walton, Webb, Wood, members, and Wm. Davidson, R. J. Fiske, R. M. Garner, E. W. Geyer, R. W. Howe, C. Gordon Hewitt, H. G. Ingerson, A. C. Johnson, J. W. McCulloch, F. L. McDonough, Jas. A. Nelson, Wilmon Newell, A. H. Pottinger, H. K. Plank, H. B. Scammell, E. Schramm, F. L. Thomas, Delmar Webb, R. L. Webster and Carrington B. Williams, visitors.

The address by the retiring President was discussed by Dr. Howard, Dr. Hopkins, Mr. Bishopp, and Prof. Quaintance, each of whom complimented the author highly upon the excellence of his paper. Upon request Dr. C. Gordon Hewitt discussed the address briefly. He was of the opinion that medical entomology had done much toward bringing the science to popular attention and favor as in its various phases it made a more direct appeal to all classes of people.

A vote of thanks was unanimously tendered Mr. Hunter by the Society.

Mr. Wilmon Newell of Texas, Mr. C. B. Williams of England, and Mr. R. L. Webster of Iowa—visitors—were each in turn called upon by the President and responded with a few appropriate remarks.

The retiring President gave the following address:

SOME OBSERVATIONS ON MEDICAL ENTOMOLOGY.

By W. D. Hunter.

It is altogether likely that no branch of entomology will develop as rapidly in the next few years as that which deals with transmission or conveyance of diseases. Medical entomology brings the importance of a knowledge of insects home to large new groups of persons, physicians and sanitarians, and thus greatly enlarges its clientele. Until recently it was the producers of crops who were principally concerned, but more and more, as new discoveries are made, entomology comes into importance in connection with the personal welfare of man. There therefore seems to be some little timeliness in observations on the present status of our knowledge of disease transmission by insects, and on possible extensions of the field. The theme also seems to be pertinent on account of the fact that this Society probably contains as great a proportion of individuals interested in medical entomology as any similar society in existence.

As a prelude attention will be directed to what may be called the biological significance of infectious diseases. This idea was probably first put into form by Lankester but was brought home to us by a former colleague W. F. Fiske. In a broad way the proper study of infectious diseases is essentially a study of parasitism. The principles involved, as Fiske states, are very similar to those which entomologists have been considering for many years. For instance there is an analogy between the human diseases and the parasites of the boll weevil. In this case there are numerous species of different families which exist on other species of insects which are dependent upon various plants. There thus exists a biocenose or complex and the boll weevil at the center may be affected by something which happens to a plant for instance which may occupy a place on the periphery of the complex. The same inter-relationships occur with the parasites of the Gypsy moth and other insects. If we should substitute

man for the boll weevil, or for the Gypsy moth, in one of these biocenoses, and substitute pathogenic organisms and their vectors for the parasites we would have a set of analogously interdependent relations. There is one striking difference. In the case of the parasites of the boll weevil the purpose of entomologists is to increase their efficiency by adding links in the chain or otherwise; while in the case of parasites of man the purpose is to break up the relations so that the attacks of the parasites against the host will be lessened. Notwithstanding this difference both efforts rest on the same foundation, that is, an intimate knowledge of the complicated relations between interlocking and inter-independent groups of animals.

The time has not arrived for the classification of the conditions under which insects may transmit diseases, as our knowledge is being extended almost daily and unsuspected conditions or sets of conditions are coming to light. For the present purpose, however, certain conditions which seem to be of importance in connection with disease transmission by insects will be mentioned, not so much in the way of a classification as an enumeration of the modes involved.

Undoubtedly the most important habit of insects which has a bearing on disease transmission is that of sucking blood. This is the basis for the transmission of the great majority of insect-borne diseases. There are probably many complicated interrelations involved. Among them seems to be the habit of certain parasites of man and other animals, such as the species of *Filaria*, to swarm in the peripheral blood during the time when nocturnal insects are active and the host is least in a condition to interfere with their attack. Of course some investigators explain this phenomenon on purely physiological reasons, that is, the supposed expansion of the sub-cutaneous capillaries when sleep begins which may allow organisms too large to reach positions immediately under the skin during the day to do so during the night. But we think it not too much to suppose, in view of what is known of the adjustments between other organisms, that the swarming in the peripheral blood is an adaptation to assist in establishing the necessary connection between two interdependent forms.[1]

Another consideration of importance in this connection is what may be called domesticity. This is of great importance, as F. Knab has pointed out,[2] in connection with such diseases as yellow fever, kala azar, and Chagas disease. It must be evident

[1] Manson, Patrick. Tropical diseases. A manual of the diseases of warm countries, 1914, 673.

[2] Knab, F. Journal of Economic Entomology, Volume V, p. 196.

that the closer the association between any insect and man the greater will be the likelihood of disease transmission, provided the other necessary conditions are fulfilled. Domesticity, therefore, is a condition which affects profoundly the phenomenon of disease transmission, and the importance of vectors in many cases at least will depend upon the degree to which their domesticity has been developed.

There is, however, a class of diseases, which is likely to become extended with future study, in which domesticity does not act as an important factor. Such diseases as spotted fever and tsutsugamushi are examples. The essential condition in such cases seems to be a natural contact with the reservoir of the disease, and accidental contact with man. The spotted fever tick is in no sense a domestic species. In fact, it is quite the reverse.[1] It decreases in numbers with the advent of man and with his operations in the fields. The tick probably acquires the virus of spotted fever from certain wild animals. A tick infected in this way happens to attach itself to man as it would to any other animal. The attachment is, therefore, to be looked upon as more or less an accident which is of importance by reason of the fact that it establishes a connection between man and the virus. Likewise tsutsugamushi fever has its reservoir in wild rodents and reaches man through the intervention of a mite, *Trombidium akamushi*, which attacks him when he goes into the fields.[2]

There are no very definitely established cases at present but it is likely that there will be found to be another class of diseases in which insects are of importance, where the essential condition is accidental contact with the pathogenic organism (instead of natural contact as in the case of spotted fever), and accidental contact with food. If cockroaches become definitely connected with tuberculosis, or similar maladies, as seems likely to be the case, they will present such a class as we believe will ultimately be found to be important.[3] Of course the importance of this mode of transference will be profoundly affected by such conditions as the abundance of the insects, and the viability of the pathogenic organisms.

Another class of cases is that of diseases which may be transmitted by insects which become contaminated by feeding upon or visiting the body discharges of invalids. An example of this is a species of *Oscinis* which seems to have developed a rather

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[1] Hunter, W. D. and F. C. Bishopp. Bulletin 105, Bureau of Entomology, U. S. Department of Agriculture.

[2] Ashburn and Craig. Philippine Journal of Science, B. III, p. 1.

[3] Barber, M. A. Philippine Journal of Science, B. IV, p. 4.

special habit of visiting the external lesions of yaws.[1] It has been noticed that this insect will be found in considerable numbers on the lesions of patients in hospitals as soon as the bandages have been removed. Of course the house fly is the most conspicuous example of an insect which may be concerned in the transmission of diseases in this manner.

The last class of cases consists of those in which insects serve as intermediate hosts for cestode or nematode parasites. The parasitism of the hog by *Echinorhynchus hirudinaceus* is especially interesting because the insect concerned belongs to the order Coleoptera which is not generally associated with disease organisms. The necessary host for one stage of this parasite is the larva of some scarabæid beetle. In Europe the species of *Melolontha* and in this country species of *Lachnosterna* are involved.[2] The infestation of the swine is rather general and sometimes of grave importance on account of perforations and for other reasons. Occasional human cases are also recorded. This is another case in which the destruction of the insect intermediate host would result in the control of the disease. It is rather novel, however, because the destruction of white grubs is undertaken on account of the injury they do the crops, while ordinarily the destruction of intermediate insect host must be predicated upon the fact of disease transmission or the fact of direct annoyance to man. A similar instance is found in a tape worm of the dog (*Dyphylidium caninum*). In this case some insect is necessary for the development of the cysticercus stage of the parasite.[3] Usually it is a flea or louse which forms this function. As in the other case man is directly concerned to at least a certain extent, since Blanchard summarized not less than sixty cases which has been recorded in man up to 1907.

Among the strictly human cestode parasites, one of the most important is *Hymenolepsis diminuta*. In this case the necessary intermediate host for the cysticercus stage may be any one of several insects. This has been proven in species of the following genera—*Pyralis*, *Anisolabis*, *Ascis* and *Scaurus*.[4] Thus certain common household insects, like the flour moth, have relation to man which is frequently overlooked.

In this discussion we have purposely omitted the attack of insects against man in purely mechanical ways, such as myiasis, and have restricted ourselves to the cases in which the injury is not direct but indirect through infection by specific organisms.

[1] Nicholls, L. Bulletin Entomological Research, III, No. 14, 199.
[2] Ransom, B. H. Yearbook, U. S. Dept. Agriculture, 1905, 155.
[3] Castellani, A., and A. J. Chalmers. Manual of Tropical Medicine, 1913, 502.
[4] Id., 503.

Undoubtedly a great deal more will be learned about different forms of direct attack of insects against man, but it is safe to say that our knowledge of that subject is much more nearly complete than on the subject of transmission of disease organisms. We shall mention, however, that the most interesting case of a malady due to direct attack is tick paralysis which is just coming to be known. The attachment of a tick causes progressive paralysis ascending from the lower extremities until all parts of the body are involved. A peculiarity is that the motor but not the sensory nerves are involved. The disease evidently occurs in Africa, and Australia as well as in North America. That it is not uncommon is shown by the fact that 13 cases have occurred in the practice of a single physician in Oregon.[1] No virus has been found and the experiments of Hadwen and Nuttall show that it is not infectious. The malady appears to be unique but may be found to be the first representative of a special class of injuries caused by insects. We are aware that Hadwen and Nuttall[2] lean toward the theory of a specific causative organism and this is supported by what appears to be a definite incubation period in the tick. Our reasons for leaning toward the theory of nerve shock are the non-infectiousness of the disorder and the relation of the location of the puncture to the symptoms. At any rate it suggests that we are probably still ignorant of many reactions between man and insects in which the health of the former is involved.

Omitting tick paralysis for the present we may summarize the more important conditions involved in disease transmission as follows:

1. Blood sucking.
2. Domesticity.
3. Contact with reservoir and accidental contact with man.
4. Accidental contact with pathogenic organisms, and accidental contact with man.
5. Feeding upon and breeding in body discharges.
6. Functioning as necessary intermediate hosts for nematode or cestode parasites.

It is possible that several new groups of diseases in which insects are concerned will be found to exist. In the investigation of beri beri and similar diseases in recent years much has been learned about the effects on the system of the presence of toxins of various kinds, and by the absence of certain so-called vitamines.

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[1] Temple, I. U. Medical Sentinel, XV, 507; see also Parasitology, VII, No. 1, 96.

[2] Nuttall, G. H. Parasitology, VI, 299–301; see also Hawden, Parasitology, VI, 283.

Is it not possible that the presence of insects in considerable numbers in food products may result in the formation of toxins, or at least increase greatly the natural tendency of the products to develop toxins? It is even conceivable that the work of some insect in the food product might result in the destruction, or reduction, of important vitamines. These speculations may be going rather far afield but one recent contribution to our knowledge seems to indicate the probability of a new class of maladies caused by insect secretions. Messrs. Seyderhelm,[1] working in Germany, have apparently proven that infectious aenemia of the horse, a widespread and mysterious malady, is caused by toxins secreted by the larvæ of the species of *Gastrophilus*. They made injections of extracts made from the larvæ of two species of the genus and reproduced conditions in experimental animals which appear to be identical with those of infectious aenemia. The toxin obtained, which they call oestrin, was found in experiments to be specific for the horse and non-pathogenic for other animals. It was even found that the toxin from *Gastrophilus hemorrhoidalis* is much more active than that obtained from *Gastrophilus equi*. The probability of the existence of a definite toxin was proven by numerous tests with chemicals and cultural methods which did not reveal any of the indications of plant or animal organisms which might be the cause of the reactions following the injections. These investigators went so far as apparently to cause the disease in susceptible animals through the agency of blood extracted from animals in which the disease had been induced solely by the injection of the toxin derived from the larvæ.

This phase of the discussion will be ended with a mere reference to the popular belief that the larvæ of *Chrysomyia* are responsible, probably through the formation of toxins, for the disease known as limberneck of fowls, and to Doctor Saunders' investigations in St. Louis which show various symptoms simulating those of poliomyelitis occuring in animals into the diet of which fly larvæ of various kinds have been introduced.[2] Whatever the outcome the work along this line which is now under way will add greatly to our knowledge.

We propose at this point to make a survey of some of the important diversities which present themselves in the nature and manner of disease transmission by insects. These include pathogenic organisms of widely different groups and striking diversity in the habits and systematic position of the insect vectors.

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[1] Seyderhelm, K. R., and R. Seyderhelm. Arch. Exp. Pathol. u. Pharmak., XXVI, 1914, 149.

[2] Saunders, E. W. Journal St. Louis Medical Association, IX, No. 12, 385–389.

Among the bacterial pathogenic organisms transmitted by insects are those causing bubonic plague, anthrax, and typhoid fever. They represent, as far as the insect intervention is concerned, both accidental and obligatory hosts.

As is well known many of the striking diseases transmitted by insects are caused by protozoan parasites, among them malaria, sleeping sickness, nagana, leishmaniasis and numerous trypanosomiases. In these cases the usual function of the insect is that of a necessary intermediate host to permit the development of the causal organism through a certain stage. However, it is evident that mechanical transmission may occur in certain cases.

Among the nematodes, species of *Filaria* are conspicuous examples of pathogenic organisms transmitted by insects. In addition to the human disease caused in this way there is filiariasis of dogs caused by *Filaria immitis* transmitted by certain mosquitoes, and it is altogether likely that other diseases of this class will be discovered in the course of time. We may also mention the probable occasional dissemination of *Necator* by the house fly and the recent work of Fibiger which shows an apparent connection between a nematode carried by cockroaches and carcinomatous lesions in the internal organs of mice. The work is not all complete, but, nevertheless, may be said to be extremely suggestive of a possible new class of diseases in which the insect may be concerned.

Among the cestodes there are cases of the occurrence of insect intermediate hosts. Among them is the disease of dogs caused by *Diphlydium caninum* which is transmitted by fleas. The precise agency of flies in the transmission of the eggs of human cestode parasites has not been made altogether clear although numerous laboratory experiments show that such eggs are frequently devoured by flies and discharged in a viable condition. As a matter of fact the house fly and other species seem to have a rather special predilection for the eggs. What remains in this connection is to determine the extent of feeding on cestode eggs under natural conditions, but the laboratory experiments and the known habits of the house fly leave little doubt on this score and show clearly the facility of the dissemination of such eggs when devoured by flies.

It will be seen from the foregoing that insects are directly concerned in the transmission of diseases caused by organisms extending over four groups from the bacteria through the protozoa and the nematodes to the cestodes.

The diversity of the insect transmitters from a taxonomic standpoint is interesting. Examples are found in the mites in two families of ticks and in four orders of insects proper, namely Diptera, Hemiptera, Siphonaptera and Siphunculata. Even the

Lepidoptera and Coleoptera may be involved in special ways as has been suggested previously.

Various relations are found to exist between disease organisms and the insect host, among them the mechanical and special or obligatory relations.

It was supposed for sometime that the transmission of disease-causing organisms in which insects are the special intermediate hosts could only occur when the infection was derived and transmitted by the same stage. It appeared, for instance, that the persistence of disease organisms from the larval to the adult stage of the house fly would be impossible on account of the processes of histolysis and histogenesis in the pupal stage. Of course, in the best known examples of hereditary transmission of disease organisms, as by ticks, there is no such apparent barrier to the development of the parasite. Recent observations by Graham-Smith[1] and others have shown, however, that certain pathogenic organisms may persist through the pupal stage of the house fly so that we may have hereditary transmission by insects with complete as well as with incomplete metamorphosis. At any rate, the investigations have been carried far enough to indicate that spore-bearing bacilli like the *Bacillus* of anthrax can easily be carried through in this way. There is doubt as to whether non-spore-bearing bacteria will survive, but it is possible that they may do so in some cases.

The list of animals in which insect-borne diseases may occur is undoubtedly incomplete but it includes man, rodents, horses, cattle, dogs and birds. In fact, there does not seem to be any restriction on the list of hosts that may become infected.

In the modes of infection certain striking diversities are to be noted. For instance, the sucking of blood and its regurgitation, the contamination of food, and possibly the secretion of specific toxins.

The geography of insect-borne diseases may also be mentioned here. Although the majority of such diseases known are endemic in tropical and sub-tropical regions we have such noteworthy exceptions as typhus fever which may occur everywhere, and spotted fever in the northern part of the United States as well as such other widespread diseases as tuberculosis and pneumonia in which the function of the insect is altogether mechanical.

Such multifarious divergencies in the conditions and modes of transmission, in the functions of the vectors, and in the nature of the causal organisms involved lead us to enquire whether there is no end to the possibilities of insect connection with diseases, and must every disease the etiology of which is not known be

[1] Graham-Smith, G. S. Flies in relation to disease, 1913, 186.

considered as possibly carried by insects. Of course there is a limit to the possibilities and other modes of infection must be well considered. This leads us to mention a danger that confronts us, namely, a possible tendency to exaggerate the importance of insect transmission and overlook, even in cases where insects may be occasionally concerned, the greater importance of other modes of infection. The function of air, water, food and contact will always be important and the enthusiast would do well to weigh them deliberately. The danger of drawing conclusions is shown by the recent history of pellagra. Doctor Sambon evolved a theory of insect transmission which fitted very well into the known facts in the epidemiology of the disease. He found its geography, seasonal incidence, and other features to be explained by transmission by *Simulium reptans*. Its causative organism could not be found and was therefore probably protozoan and ultra-microscopic like that of yellow fever which is insect-borne. It occurs commonly in persons living near running water. Therefore its possible vector was an aquatic insect. It breaks out in the spring which suggests an insect most prevalent at that season. *Simulium* is a biting insect which lives in rapidly running water and is most abundant in the spring. Therefore *Simulium* was the transmitter. Many interesting details in this theory will be recalled by those who have had the pleasure of hearing the impressive statements of Doctor Sambon. Further work, however, shows the presence of pellagra in regions where *Simulium* does not occur and the whole theory appears to have been based upon a series of coincidences.

As a matter of fact there will always be considerable danger in conclusions based upon epidemiological findings. To find that the range of some insect coincides with the range of a disease especially if the insect meets other requirements is suggestive of some form of some important relation to the malady, but transmission experiments are quite necessary to prove it. It is obvious that the danger is greater in the case of diseases in which the causal organism is unknown. Where the organism is known the finding of it in the insect under suspicion is a simple and effective guard against error.

All of the foregoing is preliminary to some observations on urgent needs of the present which entomologists should hasten to fill. The whole study of insect-borne and possibly insect-borne diseases is hampered by a lack of sufficient knowledge of the insects involved. To illustrate, at one point in the work of the Thompson Pellagra Commission certain observations seemed to show that the head louse might be the vector. It would possibly explain the striking difference in incidence by sex better than any other insect. Exact knowledge about the abundance, habits,

and dispersion was needed but was it available? No one is making studies of the insect and one turned to the literature. Piaget is very satisfactory from the purely taxonomic viewpoint but the few remarks he makes on habits were evidently based largely on supposition. In fact, most of the statements go back to Leuckart's work published in 1863.[1] We find in it a mass of statements about epidemics of psoriasis in the middle ages, about kings and princes and high church dignitaries who succumbed to gross infestation by lice. This is all interesting enough and calculated to reassure us of our advance above the dark ages but it does not supply the information we desire. As a matter of fact entomology failed in this instance to furnish information demanded in the investigations of an important and mysterious malady. There are numerous cases in which exact knowledge of insects under suspicion of disease transmission is required. Some of them, like *Stomoxys*, are receiving attention but many others remain to be studied. Investigators in related fields, like those of the organisms found in the alimentary tract of insects and of the pathological phenomena connected with insect bites are doing much work, and entomologists working on the distribution, dispersal, habits and development of insects will have to bestir themselves most actively to perform their proper share in the great problems of human health. Consider the potential importance of the biting flies of the family Psychodidæ as suggested by the transmission of pappataci fever and verruga in other countries. Our knowledge of the North American forms is not sufficient to answer any one of scores of questions which may arise in relation to the carriage of disease. Other families of blood sucking flies like the Chironomidæ are in the same condition, and what do we know about the possible vectors among the American Hemiptera? The biological side is largely terra incognita. We know possibly as much about it as was known about geography when Columbus discovered America. The taxonomic side, though in a vastly more satisfactory condition, is far from thoroughly explored.

We digress at this point to note the vital importance of entomological knowledge in connection with the investigation of diseases that may be transmitted by insects. This was never more clearly shown than in the case of a recent investigation in the Canal Zone.[2] An equine disease caused by *Trypanosoma hippicum* was under investigation and a question was raised about the possible carriage of the organism by ants. As the investi-

[1] Leuckart, K. G. F. R. Die Menschlichen Parasiten, 1863.
[2] Darling, S. T. Tr. 15th Int. Congress Hygiene and Demography, Sec. V, 1913.

gator stated: "One can readily see the danger of our situation if ants acted as carriers of pathogenic micro-organisms, for it is absolutely impossible to keep them out of the house, and they get into food in spite of our efforts." Two series of experiments were performed to determine whether ants could carry *Bacillus typhosus*, either in their alimentary tracts, or on the surface of their bodies. It was found under certain conditions that infection of culture media could be brought about by allowing ants artificially infected to come in contact with it. Referring to the other experiments Dr. W. M. Wheeler makes the following statements:[1] "The other series of experiments gave negative results, for after dissecting ants that had been fed typhoid bacilli, neither these nor any other micro-organisms could be cultivated from the intestinal tract. From these results Darling proceeds to draw an erroneous conclusion which can only be due to ignorance of the anatomy and physiology of ants. He tested his ants for formic acid and found that two of the species with which he worked (*Camponotus zonatus* and *Tetramorium guineense*) contained 2.1% of this substance, and he believed that because its germicidal value is four times as great as that of carbolic acid, the "ants may effectually sterilize bacteria in their food." Though not definitely stated, it seems that Darling supposed the formic acid to be secreted in the alimentary tract of the ant, which is, of course, erroneous, and he seems to believe that this acid is generally present in ants, whereas it is produced only by certain genera and species."

After all but one side of the subject has been touched. We have dealt largely with insects in connection with diseases the exact nature of which is unknown and with an eye to the future. There remains the whole field of diseases in which insect agency is established. There are the malarial mosquitoes, ticks, and the house fly where the problem of control of disease is largely if not essentially the control of the vector. Here are large and immediate demands for entomological research. What may be expected is shown by recent work on the house fly. The first season it revealed a previously untried agent for the destruction of the immature stages in manure that exceeds the substances that had been used in cheapness, effectiveness, and in harmlessness to the manure as a fertilizer.[2] The second season this work yielded a trap which promises to do away with the use of chemicals altogether under many conditions and results in chemotaxis which will possibly be of great importance in the control of many species. In the work on malarial mosquitoes similar progress is

[1] Wheeler, W. M. Am. Journ. Tropical Diseases, II, No. 3, 163.
[2] Cook, F. C., et al. Bulletin 118, Bur. Ent., U. S. Dept. Agric.

most likely to be made. Such investigations give much to do but while we are engaged in supplying the immediate demands we should give heed to the inevitable future demands for complete information about the numerous insects fulfilling the requirements of blood sucking, domesticity or otherwise for the transmission or dissemination of disease. It is only by such means that we can meet the demands that will be made on entomology and give the science the place it deserves in relation to the welfare of man.

Two Hundred and Eighty-Third Meeting,

February 4, 1915.

The 283d regular meeting of the Society was entertained by Mr. C. L. Marlatt at the Sængerbund Hall, February 4, 1915. There were present: Messrs. Baker, Barber, Bishopp, Böving, Busck, Caudell, Champion, Cory, Craighead, Crawford, Cushman, DeGryse, Fink, Fisher, Gahan, Gill, Greene, Howard, Hutchinson, Hyslop, Isely, Knab, Kotinsky, McIndoo, McGregor, Marlatt, Middleton, Ransom, Rohwer, Rust, Sanford, Sasscer, Schwarz, Shannon, Siegler, Simanton, Snyder, Stiles, Townsend, Turner and Walton, members, and A. G. Ackerman, W. M. Davidson, R. J. Fiske, G. L. Garrison, E. W. Geyer, A. C. Johnson, W. V. King, F. L. McDonough, H. L. Nichols, H. K. Plank, and J. F. Turner, visitors.

Messrs. L. O. Jackson and D. E. Fink were elected to active membership.

The following papers were presented:

On the Reflex Bleeding of the Coccinellid Beetle, Epilachna borealis ..... Dr. N. E. McIndoo.[1]

An Asiatic Insect Pest in America via Europe ..... August Busck.[1]

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[1] Withdrawn from publication.

NOTES ON THE NESTING HABITS OF SOME SOLITARY WASPS.[1]

By J. B. Parker.

I. PSAMOPHILA VIOLACEIPENNIS (LEP.)[2]

In constructing their nests the wasps of this species dig down more or less vertically to the depth of about an inch and then at the bottom of the shaft construct a brood chamber usually at one side. This is somewhat circular in shape varying from three-fourths to one inch in diameter and is about half an inch in depth. In digging the nest the wasp loosens a quantity of sand with her mandibles and front feet, then gathers it up with her front legs and holds it firmly pressed back into her grasp by the use of her mandibles. With the load of sand thus firmly held she backs out of the excavation to a short distance from the entrance, drops her burden, steps forward over it and reënters the burrow for another load. She is thus continually popping in and out of her nest while it is in process of construction. While digging the sand loose within the burrow the wasp makes a low humming sound much like that which the mud-daubers make when constructing their nests, but by no means so loud. It requires about ten minutes for the wasp to dig her nest, which is not begun until after a caterpillar has been found and paralyzed.

When the nest is complete the wasp hurries away to bring her caterpillar, running over the sand instead of flying. She turns the caterpillar upon its back, seizes it by the thorax with her mandibles and walking astride it drags it to the nest. Whether she uses the second pair of legs to support the larva while transporting it I could not positively determine, but I am inclined to think she does. She leaves the caterpillar at the entrance to the nest, goes within, turns round, comes to the entrance and having seized the caterpillar with her mandibles she backs into the nest dragging her prey after her. The egg is placed transversely on the side of the caterpillar on one of the more anterior abdominal segments. After oviposition the wasp emerges from the nest and seals up the entrance, in doing which she digs a quantity of sand down into the opening and then rams it down with her head, repeating the performance until the opening is completely filled up. She then smooths over the surface above the entrance to the nest and flies away.

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[1] Contribution from the Biological Laboratory of the Catholic University of America, No. 2.

[2] Specimens of this species and also of the two following were kindly identified by Mr. S. A. Rohwer.

Wasp No. 55 was observed running excitedly about over the sand with her abdomen arched and her wings flipping nervously in a manner that characterizes this species when seeking a place for a nest after having captured a caterpillar. She digged her nest about fifteen feet from the point where she had left her caterpillar lying in a clump of weeds. When the nest was complete and the wasp had gone to bring her caterpillar I placed my camera in position at the nest. The wasp quickly returned with her caterpillar and when she had taken it inside I reached down into the nest with a pair of forceps and pulled it out again. The wasp came out of the nest, stepped astride the caterpillar and bending her abdomen beneath the thorax inserted her sting on the ventral side. She then took the caterpillar inside as before and I promptly pulled it out again. This time she came out and with her mandibles seized the caterpillar, which was lying dorsal side up, and inserted her sting on the ventral side of the abdomen five successive times, each time in a different segment proceeding backward from the first or second. Once more she took the caterpillar inside the nest and again I pulled it out. This time, however, she held on to her prey and I pulled her out too.

She at once picked up her caterpillar and started off with it. After carrying it about aimlessly for a few minutes she placed it amid some grass near by and began the construction of a new nest some distance from the first one. It required just nine minutes for her to complete this nest. When she had it finished she returned to her caterpillar and took it inside the new nest.

In the meantime a number of parasitic flies had discovered the wasp and her prey. So far as my experience goes these flies do not pay any attention to the caterpillar so long as the wasp is not near it; but just as soon as she begins to work with it they seek to place their young upon it or to place them in the entrance to the nest. Since I wished to rear this wasp from the egg I was kept busy chasing the flies away. When the wasp entered the new nest I succeeded in driving all the flies away except one, which I was obliged to capture and which Dr. C. H. T. Townsend finds to be a new species belonging to the genus *Hilarella*.

As soon as the wasp had emerged and sealed up the nest I digged it up and after making a photograph of the egg in place on the caterpillar (fig. 2) I placed them in a glass-covered plaster breeding cell and buried the outfit to the depth of an inch below the surface of the sand in the garden. On the morning of July 22 the egg showed no evidence of hatching but on the following morning at the same hour the larval wasp was feeding on the caterpillar (fig. 3). In the case of this species the head of the larva develops at the end of the egg attached to the food provided by the mother wasp, just the reverse of what takes place in the

case of species of *Bembex* and *Bembidula*. As a result the larva makes a hole through the egg covering where this is attached to the caterpillar and then through the body wall of the caterpillar. It then thrusts its head through the opening and begins to feed on the internal parts of its victim. Thus the egg still remains in place till the growing larva ruptures it and even then it remains for a time as a collar about the larval wasp where it enters the caterpillar.

The young wasp does not change its position but remains with its anterior end thrust inside the caterpillar, which contracts in length as the feeding of the larval wasp proceeds. On the morning of the twenty-fifth the caterpillar had contracted considerably (fig. 4) and the wasp had greatly increased in size. On the twenty-sixth the caterpillar was entirely consumed—nothing remained but a few fragments of integument—and the fully developed larval wasp was spinning threads of silk over the sand in the cell (fig. 5). At six p.m. of the twenty-sixth the larval wasp was busily spinning its cocoon which was fully formed on the morning of the twenty-seventh (fig. 6).

The cell with its contents was placed in the sand in the garden and was not again disturbed till September 7, when it became necessary to transfer it to another place. To my surprise I found that the adult had emerged in the cell and unable to escape had perished there. The insect was badly decomposed and I should judge that it had been dead for at least a week.

Wasp No. 57 was observed July 27 busily engaged in digging a nest and when this had been digged to the depth of about one inch she suddenly backed out of the burrow and, if I may be permitted the use of a vulgar expression, "threw a fit." Apparently she had bitten into something that was exceedingly obnoxious to her. She rubbed her mouth parts violently with her front feet, twisted and contorted her body, bit into the stems and leaves of the weeds about her and displayed every manifestation of great distress. I got down quite close to her but could discover nothing on her body or appendages that could be the cause of her strange conduct. After some time she returned to her unfinished nest but no sooner had she thrust her head into the opening than another paroxysm ensued. This was less violent than the first. Again she returned to her nest but was affected as before just so soon as she reached the entrance and she then abandoned her task.

Curious to know what had been the source of her discomfort I digged down into the ground carefully following the opening made by the wasp. At the bottom of it I found a living but paralyzed caterpillar, the remains of a second one and the newly-formed cocoon of a wasp, but not of this species. Mingled in

the sand at the bottom of the excavation made by the wasp there was considerable excrement from the caterpillars but what it was that proved so objectionable to the wasp I could not determine.

On July 29 No. 58 was discovered constructing her nest, to complete which required a trifle more than ten minutes. In this case I pulled the caterpillar out of the nest no less than eight times. I hoped to induce the wasp to sting the caterpillar as No. 55 had done but she made no attempt to do so. On three occasions I pulled her out of the nest, clinging to the caterpillar with her mandibles, yet she never left the nest or made any effort to carry off her caterpillar. This contention over the caterpillar caused considerable sand to roll down into the nest so that on three different occasions the wasp had to lay the caterpillar aside and clean out the nest. A parasitic fly also joined the controversy and in spite of my efforts succeeded in placing one or more larvæ upon the caterpillar. None of these things discouraged the wasp; she was determined to put her caterpillar in that hole and I finally permitted her to do so. When the caterpillar was finally dragged within the nest the fly advanced to the opening, backed around and deposited two or more larvæ on the edge of it whence they wriggled off and dropped to the bottom of the nest.

The wasp remained within the nest not quite two minutes. After she had emerged and filled up the nest I captured her with my net and digged up the nest. Although less than ten minutes had elapsed from the deposition of the egg of the wasp to the removal of the caterpillar from the brood chamber yet one of the parasitic maggots was upon the egg, three more were clustered about it at the point of attachment to the caterpillar and a fifth was tucked in between the fourth and fifth abdominal segments on the ventral side. I removed these tiny larvæ but in doing so I must have injured the egg for it decomposed in the breeding cell.

No. 62 was discovered constructing a nest on August 1 and I used the same tactics with this wasp as with the preceding. Although I repeatedly pulled the caterpillar out of the nest and also pulled the wasp out too on several occasions she made no attempt to sting the caterpillar or to carry it away. On August 8 I discovered No. 64 filling up the entrance to a nest in which she had just placed a caterpillar. When this task was completed she began immediately to construct a new nest a few inches from the one just sealed up. When the nest was about one inch deep I approached quite close to the nest and the wasp became frightened and flew away, which fact leads me to believe that in this case the wasp had no caterpillar in readiness to place within this

nest; for in the case of each of the wasps previously observed I digged away the weeds and sand up to within a few inches of the nest before the wasp had completed it and yet not one of them abandoned her nest. I waited an hour but the wasp did not return and I then digged up the completed nest. It contained a large caterpillar with three dipterous larvæ upon it which were feeding upon the egg of the wasp of which little remained.

One thing brought out by these limited observations is the difference in individuality or temperament shown by members of the same species. No. 55 would tolerate no interference with her nesting operations; she picked up her caterpillar, carried it off and put it in a new nest. Nos. 58 and 62, however, could not be driven from their nests by the most persistent interference with their work. These wasps continued the construction of their nests although I completely altered the appearance of the nesting site before the nests were finished, whereas No. 68 abandoned a half-finished nest simply because I approached a trifle too close.

II. OXYBELUS QUADRINOTATUS SAY.

There has been considerable discussion and difference of opinion as to the manner in which this little wasp carries her prey. In the March number of Psyche, 1894, Ashmead cites Verhoeff as authority for the statement that *Oxybelus* does not paralyze its prey by stinging it because of the fact that the abdomen is too rigid to permit of this action. This author maintains that *Oxybelus* kills the flies by crushing the thorax with her mandibles. In the same article Ashmead also cites Fabre as authority for the statement that *Oxybelus* carries her prey home impaled on her sting. The Peckhams, however, in their work on the solitary wasps, a part of which is the report of their observations upon this particular species (*quadrinotatus* Say), take Fabre to task on this point and insist that this wasp, unlike other digger wasps, uses her third pair of legs to carry the fly, which is held tightly clasped by the head. In this way they account for the manner in which the fly projects behind the wasp in flight. It is significant to note here that the Peckhams report complete failure in all their attempts to make the wasp drop the fly she carried.

The little wasps of this species nest in great numbers in the sand near my home, using the common housefly to store their nests. I found it an easy matter to determine just how this species carries her victim. As the wasp entered the nest, which is always closed after each visit, I seized the fly with a pair of forceps and pulled the wasp adhering to it out of her nest backward while observing her under a lens. I did this repeatedly and there is not the slightest doubt of the fact that she carries

the fly firmly impaled upon her sting. I found it a difficult matter to pull the fly away from the wasp. After having done so I placed the fly still held with the forceps quite near the wasp yet keeping it under the lens and saw her pounce upon it and drive her sting deep into the ventral side of the thorax. Whether she kills her victim by stinging it I cannot say but of her ability to do so there can be no question. When she had fastened her sting into the thorax of the fly she would strive to pull the fly away and she used all six legs to do this. The accompanying photograph (fig. 9) shows the wasp ready to open her nest, holding her prey with her sting, her first pair of legs ready to dig and her second and third pairs resting upon the ground.

III. SPHEX URNARIA (DAHLB.)

On August 1 a wasp (No. 63) of this species was observed carrying a caterpillar to her nest. She carried it ventral side up holding it with her mandibles and supporting it with the first pair of legs while walking with the second and third pairs, varying her proceedure by making occasional flights of a foot or more. When discovered she was more than one hundred feet from her nest yet she went forward to it on nearly a direct line although she had to pass at times through weeds almost as high as a man's head. When she arrived in the immediate vicinity of the nest she had to search about for some time to find it, due possibly to the fact that she was somewhat confused by my presence for I had to follow her very closely to avoid losing her in the weeds.

When she found the nest she laid the caterpillar aside and opened the nest by digging away the sand with her front feet and removing with her mandibles the pebbles and bits of wood and coal with which the opening had been filled. After inspecting the interior of the nest the wasp came out and seizing the caterpillar backed down into the nest dragging it after her. When she emerged she again filled up the entrance by placing therein the bit of wood and coal and pebbles she had removed in opening it and then digged sand in upon them. When she had completed her task I captured her with my net.

The nest contained four "measuring worms," larvæ of geometrid moths, and a larger caterpillar, the one I had seen her take inside. Upon one of the geometrids was an unhatched egg placed horizontally (fig. 8). Whether this is the usual mode of placing the egg or whether the small size of the caterpillar made it necessary to place the egg thus in this particular case I am unable to say. From the position of the caterpillars in the broad chamber I judge that the one bearing the egg was the first placed in the nest.

The contents of the nest were placed in a breeding cell which was buried an inch below the surface of the sand in the garden. On the morning of August 2 the egg had not hatched but the caterpillars by spasmodic movements had changed their position in the cell and most of them had passed fæces. They responded readily when pricked with the point of the forceps. On the morning of the third the egg had hatched and the young larva was feeding upon the caterpillar to which the egg was attached, pursuing a course quite similar to that followed by *P. violaceipennis*. On the morning of the fifth the first caterpillar was almost completely consumed and the remaining ones responded but feebly to stimulation. On the sixth the larva was devouring the second caterpillar having its head and thoracic segments thrust within the body of the caterpillar. On the morning of the eighth it had devoured all the caterpillars and was beginning the construction of its cocoon, which was completed on the ninth.

The cocoon of this species is yellowish and semitransparent whereas that of *P. violaceipennis* is almost black and opaque. The adult of the latter emerged from the cocoon at the end of about one month; the former has gone through the winter in the cocoon. *Sphex* digs her nest and then searches for caterpillars with which to provision it; *Psamophila* captures her caterpillar and then digs a nest to put it in. Both bring the sand out of the nest holding it with the front legs and mandibles. *Psamophila* always backs away from the entrance of the nest with her load of sand which she drops and walks over in reëntering the nest. Not so with *Sphex;* after backing out of the nest with her load of sand she turns round and carries the sand forward for some distance from the nest and usually throws it in a neat pile. One individual, however, after backing out of the nest flew up into the air with each load of sand and scattered it in all directions.

Explanation of Plate.

Fig. 1, *Psamophila violaceipennis* (Lep.) with caterpillar at entrance to nest. × ½.

Fig. 2, caterpillar with egg of *P. violaceipennis* (Lep) in place. Natural size. Egg deposited July 20.

Fig. 3, larva from egg in Fig. 2, natural size. July 23.

Fig. 4, larva from egg in Fig. 2, natural size. July 25.

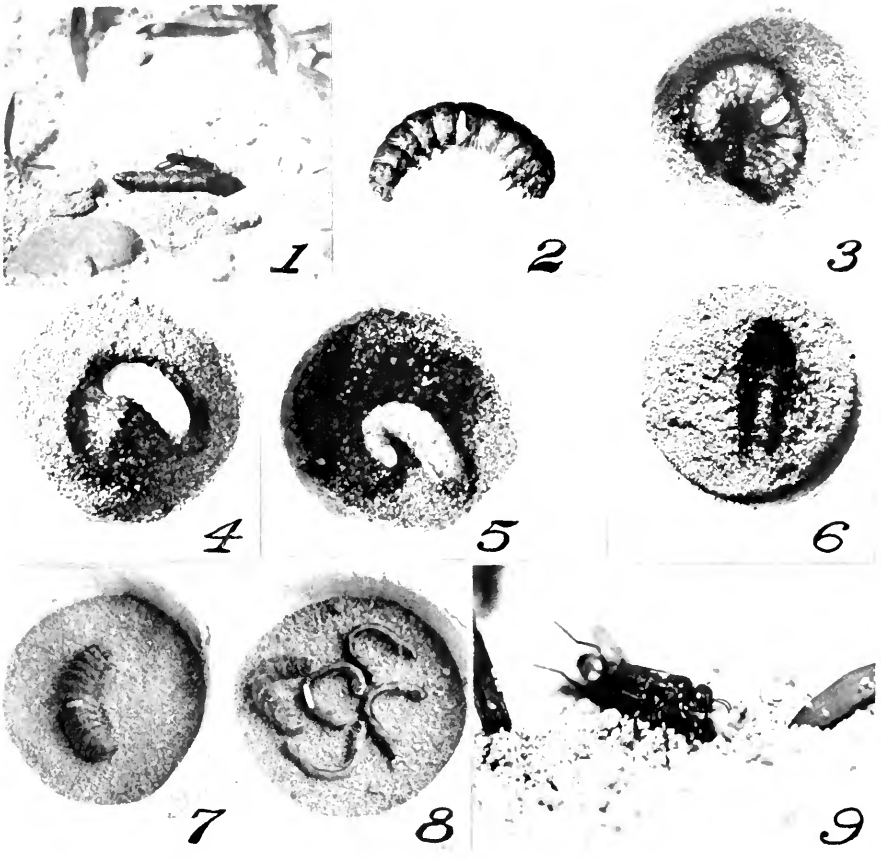
Fig. 5, larva from egg in Fig. 2, natural size. July 26.

Fig. 6, cocoon formed by larva in Fig. 5, natural size.

Fig. 7, egg of *P. violaceipennis* (Lep.) in place, natural size.

Fig. 8, content of nest of *Sphex urnaria* (Dahlb.) in breeding cell, natural size.

Fig. 9, *Oxybelus 4-notatus* Say at entrance of nest holding fly impaled on her sting. × 2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In discussing this paper Mr. Walton recounted having once observed a species of *Sphex* in New Mexico attempting to dig a hole in the bottom of a galvanized iron wash-tub.

ONE NEW GENUS AND TWO NEW SPECIES OF CERAMBYCIDÆ.

By W. S. Fisher, *Branch of Forest Insects, Bureau of Entomology.*

In working over the Cerambycidæ received from the field men of the branch of forest insects, Bureau of Entomology, during the past year, the following apparently new species were encountered. For one of these, a species from California, the larva of which bores in pine cones, it was found necessary to erect a new genus.

All types and specimens mentioned are deposited in the United States National Museum in Washington.

Hylotrupes juniperi n. sp.

Male: Elongate, rather robust, subdepressed, shining black. Antennæ three-fourths as long as the body. Thorax rounded on the sides, suddenly narrowed towards the base, which is slightly tubulate, the sides are densely and confluently punctured, the disc with three smooth longitudinal elevations, one median reaching from base to middle, and a crescent shaped one on each side forming a somewhat broken circle. Elytra each with two indistinct lines, surface very densely punctured, the punctures larger and less dense on the basal half, and becoming very small towards the apex, sparsely clothed with short black recumbent hairs. Femora not clavate. Fifth ventral segment truncate behind. Length 22 mm.; width 6 mm.

Female: Differs from the male in having the antennæ only two-fifths as long as the body, and the fifth ventral segment broadly rounded behind. Length 25 mm.; width 7 mm.

Habitat: Santa Catalina Mountains, Arizona. Elevation 4200 to 5000 feet. W. D. Edmonston and M. Chrisman, collectors.

Type and *allotype:* Cat. No. 19129 U. S. N. M.

Described from seven specimens. Two males and two females recorded under Bureau of Entomology Number Hopk. U. S. 12698. Material collected December 1, 1914, by W. D. Edmonston, from heartwood of green limb on dying Juniper (*Juniperus pachyphloca*). One male and two females recorded under Bureau of Entomology Number Hopk. U. S. 12259e, and reared from material collected by M. Chrisman on November 18, 1913, in the same locality from dying Juniper. Larva always makes burrows with the grain of the wood, half in the bark and half

in the sapwood, occasionally one in the sapwood. Larva when full grown makes burrow straight into the heartwood and pupates.

This species is very closely allied to *Hylotrupes amethystinus* Lec., but is distinguished from that species by having shining black elytra without any trace of the violet color.

Hylotrupes amethystinus Lec. has somewhat of a similar habit but as far as known, only attacks dying and felled *Libocedrus* and *Thuja*. The larva works under the bark, making broad winding excavations, eating the inner bark and outer sapwood, sometimes separating the bark from the wood, then enters the wood, sometimes burrowing to the heartwood where the burrows become longitudinal, pupating in either bark or wood, but usually in the heartwood.

Paratimia new genus.

Eyes moderately finely granulated, deeply emarginate, partly enveloping the base of the antennæ, but not as deeply emarginate as in *Atimia*. Head broad and short, the front perpendicular. Labrum transverse, ciliated with long hairs. Palpi unequal, the maxillary about twice as long as the labial last joint triangular. Antennæ slender, shorter than the body in both sexes, 11-jointed; second joint less than half as long as the third, which is a little shorter than the fourth, fifth joint longest; punctured and pubescent. Front coxæ rounded, narrowly separated by the prosternum, cavities angulated externally, completely closed behind; middle coxæ separated by the mesosternum about twice the distance which separates the front coxæ, cavities slightly angulated externally, completely closed by the sterna. Mesosternum concave between the coxæ, emarginate behind. Metasternum deeply emarginate behind. Legs short, femora slightly clavate, front tibiæ with one, middle and posterior ones with two small spurs, hind tarsi with first joint equal to the two following united.

Type: Paratimia conicola n. sp.

This new genus belongs to Leconte and Horn's tribe Atimiini but differs from the genus *Atimia* by having the front coxæ narrowly separated by the prosternum, the cavities angulated externally, eyes not quite as deeply emarginate and the last joint of the maxillary palpi being triangular. In general form it resembles a Lamiine but the front tibiæ are without the oblique grooves.

Paratimia conicola n. sp.

Male: Elongate, slender, subcylindrical. Thorax somewhat cordiform, not wider than long, front angles rounded, sides rounded just before the middle, then obliquely narrowed towards the base, surface fusco-piceus, coarsely and thickly punctured, and rather densely clothed with long prostrated reddish-brown hairs, those on the posterior half and underside whitish. Elytra a little wider than the thorax, two and one-half times as long as wide, sides nearly parallel, slightly narrowed towards the tips

which are separately rounded, surface brown, sparsely, rather finely punctured, sparsely clothed with long prostrated reddish-brown hairs intermixed with long erect ones of the same color, and with a very narrow sutural stripe of dense prostrated whitish hairs. Scutellum subquadrate, rounded behind, surface densely punctured and densely clothed with long prostrated hairs. Underside fusco-piceus, surface densely punctured, clothed with long prostrated whitish hairs. Femora, tibiæ and tarsi brown, sparsely clothed with semi-erect hairs. Fifth ventral segment about as long as the fourth, broadly emarginate behind. Length 10 mm.; width 3 mm.

Female: Differs from the male in having the fifth ventral segment longer than the fourth and rounded behind. Length 12 mm.; width 3 mm.

Habitat: Monumental Mines, California. Elevation 3600 feet. P. D. Sergent, collector.

Type and *allotype:* Cat. No. 19130 U. S. N. M.

Described from five specimens, four males and one female, recorded under Bureau of Entomology Number Hopk. U. S. 10856d. Reared by Mr. J. M. Miller from old cones of *Pinus attenuata,* collected October 2, 1913, by P. D. Sergent.

This interesting species is somewhat suggestive of a narrow *Atimia confusa.* It differs from that species by its reddish-brown color, elytra with a narrow whitish sutural stripe and tips separately rounded, thorax not wider than long and being somewhat cordiform.

DESCRIPTIONS OF NEW NORTH AMERICAN MICROLEPIDOPTERA.

By August Busck.

In one of my early papers (Journ. N. Y. Ent. Soc., vol. VIII, 1900, p. 234), I expressed the opinion, that in the then existing unsatisfactory state of our knowledge of American Microlepidoptera, it was of little value (or worse) to describe promiscuously new species from collected material; only when working up a group systematically did it seem to me excusable to describe species of which the biology was not known.

This attitude has influenced my production of descriptive work during the past years and I have described new species only as the demand for names from correspondents necessitated it, or when other considerations made it desirable or obligatory. There are for this reason hundreds of Micros as yet undescribed in the collection of the United States National Museum.

I still have a disinclination for new species of which we know nothing more than the type specimens, (and the present paper

contains mainly species, of which the life history is known), but our knowledge of the group has now so advanced, that such descriptions can be made with profit to science and I realize the obligation to make our North American fauna known so far as possible. I also fully realize the propriety and value of the Monroe Doctrine as applied to Entomology; it is an advantage to science that American insects should be worked up by Americans and that the types should be deposited in American Museums in order that it shall not be as necessary for future generations to go to Europe for information on American insects, as it has been for the present generation. If we do not do our own work, others will quite rightly do it and with that result.

In a letter lately received from my good friend and master Edward Meyrick of England, which I am permitted to quote, he writes: "As to the principle of describing such species (without biological notes) from North America, I describe all the material that I have in hand of a family, before publishing that family in the Genera Insectorum in order to make this work as complete as possible. If you have species in good series, describe them. I have thousands of undescribed species in hand and material coming in constantly from all parts of the world, therefore I don't want to do American species, if any one else will do them. But I want the North American species described; if you do not do it I will have to do it myself." I quote this not because an excuse is needed to describe our American Micros, but in order to give my indefatiguable learned co-worker due credit not only for his own enormous personal share in the progress of our knowledge of the world's Microlepidoptera, but also for his ever incitating influence on other workers, forcing us to keep step with him as far as we are able.

Memythrus perlucida n. sp.

Labial palpi bright yellow, shaded exteriorly with vivid red. Head reddish brown. Antennæ reddish brown. A narrow collar light yellow, bordered anteriorly with blue metallic scales. Thorax dark reddish brown, narrowly edged posteriorly with yellow. Forewings light reddish brown with the veins bluish black; extreme base of costa light yellow; cilia blackish brown. Hindwings glassy blue, entirely transparent, except a narrow edge before the cilia, which is reddish brown mixed with black; veins black, touched with red. Cilia backish brown. Abdomen reddish brown with a narrow light yellow annulation on the posterior edge of second joint and a broader yellow annulation on fourth joint. In the male the posterior joints become somewhat lighter, touched with yellow; a short double yellowish brush above the uncus, not projecting beyond the claspers. Legs red, tarsi shaded with yellow. Alar expanse: 28–32 mm.

Type: Cat. No. 19223, U. S. N. M.

Reared by Mr. Brunner from *Populus trichocapa*. The species is closely allied to the other *Populus* species, *M. dollii* Neumoegen, and *castaneum* Beutenmuller, but at once distinguished by the clear hindwings.

Psacaphora cambiella n. sp.

Second joint of labial palpi reddish golden; terminal joint black. Face, head and thorax shiny iridescent black. Antennæ black with silvery white tips. Forewings purplish-black with a large, central, light brick-red part, which occupies about half the wing area; within this red part are three small oval black spots edged with purplish silvery scales; one of these spots is on the middle of the fold, the other at the end of the cell and the third about the middle of the cell, touching the black costal edge of the wing; at apical fifth is a light yellow costal dash, continuing into the cilia and on the terminal edge is a purplish silvery longitudinal streak within the black border; cilia black. Hindwings and cilia purplish black. Abdomen black. Legs black with golden yellow inner sides and with a golden annulation on posterior first tarsal joint. Alar expanse: 13–14 mm.

Habitat: Evaro, Mont., J. Brunner, Coll.

Type: Cat. No. 19224, U. S. N. M.

Bred from cambium of *Salix*.

Close to *P. purpuriella* Busck, in coloration, but different in pattern.

Eucordylea gallicola n. sp.

Second joint of labial palpi white with three indistinct dark brown annulations; brush dirty white with dusky tip; terminal joint white with two clear cut black annulations. Antennæ thick, ochreous with black annulations. Face and head ochreous white, head sprinkled with fuscous. Thorax whitish fuscous. Forewings light fuscous with three black costal dashes, one near base, one on the middle and one at apical third; these black costal spots are exteriorly edged by thin, ill-defined white lines, which continue obliquely across the wing, the two outer ones meeting on termen just below apex; two longitudinal black streaks on the middle of the wing, one just before and one after the end of the cell; before and below the first of these is a small group of slightly raised, rust-red scales on the fold; cilia fuscous dusted with black. Hindwings light fuscous with ochreous fuscous cilia; in the male with a large expansible, bright yellow hair tuft at base. Legs ochreous white sharply barred with black; tarsi with black annulations. Alar expanse: 13 mm.

Habitat: Colorado Springs, Colo., S. A. Rohwer, Coll.

Type: Cat. No. 19225, U. S. N. M.

Bred from galls of the Sawfly, *Euura macgillivrayi* Rohwer, on *Salix*.

The species reminds much of the genus *Recurvaria* from which *Eucordylia* is a derivative.

Recurvaria alnifructella n. sp.

Second joint of labial palpi dark fuscous with apex white; terminal joint white with two broad black annulations, one near the base and one just before the tip. Face and head ochreous white. Antennæ light fuscous with narrow black annulations. Thorax ochreous white, slightly sprinkled with fuscous and with two minute black dots at the base of the hindwings. Forewings black with white dorsal edge; an indistinct white, outwardly curved costal streak at apical fourth and an opposite oblique dorsal white streak limit an apical area, which is slightly mottled with lighter scales; three small black tufts of raised scales on the border of the white dorsal part; cilia ochreous fuscous. Hindwings silvery fuscous, semitransparent; in the male with a long ochreous expansible hairpencil at base; cilia ochreous. Abdomen dark fuscous with light ochreous anal tuft and with an ochreous patch on the upper side of the first joints. Legs black with ochreous white annulations at the end of all the joints. Alar expanse; 12 mm.

Habitat: Falls Church, Va., Carl Heinrich, collector.
Type: Cat. No. 19226, U. S. N. M.

The larva feeds in the catkins of alder and hazel in the same fashion as *Eucosma walkerana* Kearfott, the larva of which is described by Packard in his "Forest Insects" p. 636, misidentified as *Gelechia coryliella* Chambers (*Menesta tortriciformella* Clemens).

The full grown larva of the present species is about 12 mm. long with a light brown head, dark brown thoracic shield and anal plate; small brown tubercles, arranged in a transverse row on each segment; body is white with a broad pink annulation in each joint; thoracic legs light brown; abdominal prolegs with a circlet of hooks, which is broken on each side, interiorly and exteriorly.

Gnorimoschema gibsoniella n. sp.

Labial palpi white dusted with blackish brown scales; an ill-defined blackish annulation on the middle of terminal joint. Face and head white speckled with blackish brown. Thorax white strongly dusted with blackish brown. Forewings with a bluish white ground color, so strongly suffused with brown and blackish scales, as to make it difficult to determine what is the ground color; each white scale has a dark band before the tip; three ill-defined brown spots, one on the middle of the cell, one obliquely below on the fold and one at the end of the cell; basal part and dorsal edge of the wing least suffused with dark scales so as to slightly outline the pattern found in the type of the genus; cilia white strongly dusted with black and brown. Hindwings light fuscous with still lighter cilia. Abdo-

men light fuscous sprinkled with black; basal joints above short scales, golden yellow. Legs whitish, heavily barred and dusted with blackish brown; tarsi blackish brown with indistinct narrow white annulations. Alar expanse: 22 mm.

Habitat: Aveme, Manitoba, N. Criddle, Coll.
Foodplant: Solidago rigida.
Type: Cat. No. 19227, U. S. N. M.
Cotypes in Ottawa Museum.

Very close to but quite distinct from the type of the genus. Named in honor of my friend Arthur Gibson, who states that the species makes a gall on *Solidago rigida* just above or close to the ground.

Gnorimoschema petrella n. sp.

Labial palpi white, dusted with light fuscous. Antennæ white with dark brown annulations. Face, head and thorax white, strongly dusted with fuscous. Forewings white, liberally and evenly dusted with brownish fuscous atoms and with three small, indistinct, black dots, one on the middle of the cell, one obliquely below on the fold and one at the end of the cell; cilia dusky white, dusted with fuscous. Hindwings dark fuscous with the cilia a shade lighter. Abdomen dark fuscous with whitish undersides. Legs with heavy dark brown barred exteriorly and with broad dark brown tarsal annulations. Alar expanse: 17 mm.

Habitat: Hampton, N. H.; May, S. A. Shaw, Coll.
Type: Cat No. 19228, U. S. N. M.

Dichomeris vacciniella n. sp.

Labial palpi with moderate, bluntly triangular tuft, brownish fuscous, speckled with white on top of the brush; terminal joint light brown, dusted with black and with extreme base white externally. Face light brown. Head dark fuscous. Thorax and patagia brown. Forewings dark brown, sparsely and irregularly dusted with black scales; three small, round, black dots, edged with white scales, one on the middle of the cell, one obliquely below and before it on the fold and one at the end of the cell; apical part of the wing strongly suffused with purplish black scales, the extreme apical and terminal edge black; cilia dark fuscous with light ochreous brown tips. Hindwings light fuscous, suffused with black on the outer costal part; cilia light gray. Abdomen light ochreous brown, dusted laterally with black. Legs light ochreous brown, suffused exteriorly with black and with blackish tarsal annulations. Alar expanse: 15–17 mm.

Habitat: Pemberton, N. J., H. D. Scammell, Coll.
Type: Cat. No. 19229, U. S. N. M.
A very distinct species, bred by Mr. Scammel from cranberry.

Symmoca novimundi n. sp.

Second joint of labial palpi dark bronzy brown with light ochreous inner sides and apex; terminal joint dark brown with the extreme tip ochreous. Face light ochreous. Head dark fuscous. Antennæ dark fuscous with apical third pale ochreous. Thorax dark fuscous with the tips of the patagia and two small posterior dots whitish ochreous. Forewings dark fuscous with a small ill-defined whitish ochreous spot below costa near base; with a concolorous, ill-defined, larger spot on the end of the cell touching costa and with a small whitish ochreous costal spot at the apical fourth, sometimes with an opposite small dorsal dot; cilia dark fuscous. Hindwings light fuscous with whitish fuscous cilia. Abdomen dark fuscous with light anal tuft. Legs dark fuscous with light ochreous annulations at the base of the joints. Alar expanse: 12–13 mm.

Habitat: Roxborough, Pa., September, F. Haimbach, Coll.; Montclair, N. J., August, W. D. Kearfott, Coll.

Type: Cat. No. 19230, U. S. N. M.

This is the first record of this interesting old world genus from America; the species is typical of the genus and very close to the European *S. quadripuncta* Haworth, but is smaller, with the markings more whitish, not yellow and with the palpi differently colored.

Ethmia zavalla n. sp.

Labial palpi white, second joint black exteriorly. Face and head white. Antennæ dark brown with white basal joint. Thorax white with one posterior and two lateral black dots; patagia white with black basal dash. Forewings white with extreme costal base black and with 10 black dots besides a marginal series of 13 black dots; three dots in a line from base of costa to basal third of dorsum; two others in a line at ıgh' angles w th the first, to the first costal marginal dot; one dot in the middle of this angle on the cell, two at the end of the cell and one beyond the cell; the first dorsal and the first costal marginal spots are nearly opposite and are both elongated; cilia white with a black apical tuft. Hindwings whitish fuscous with white cilia; vein 8 free, not connected with the cell by a cross vein. Abdomen whitish fuscous. Anterior legs white, barred with black, tarsi annulated with black; posterior legs whitish with dusky tarsi. Alar expanse: 18 mm.

Habitat: Zavalla Co., Tex., April F. C. Pratt, Coll.

Type: Cat. No. 19231, U. S. N. M.

Allied to the following species, *E. prattiella* and to *E. coranella* Dyar, in size and ornamentation; different from the former in the fewer and larger black dots, from the latter by the absence of any longitudinal streaks; from both in the coloration of the palpi.

Ethmia prattiella n. sp.

Labial palpi pure white, terminal joint unusually short. Face and head white. Antennæ dark brown with white basal joint. Thorax white with two minute anterior black dots and with two lateral dots; patagia white with a small basal black dot. Forewings white with 16 small black dots besides a marginal series of black dots; one dot at extreme base of the wing; five dots in a longitudinal row on the upper half of the wing from base to beyond the first costal dot; two are on the fold, one below the fold, three within the cell, three beyond the cell; cilia white. Hindwings whitish fuscous with white cilia. Abdomen light fuscous. Legs whitish with dusky tarsi. Alar expanse: 17 mm.

Habitat: Zavalla Co., Tex., April, F. C. Pratt, collector.
Type: Cat. No. 19232, U. S. N. M.

Blastobasis eriobotryæ n. sp.

Labial palpi dark purplish fuscous with the inner side and extreme apex light ochreous. Face light ochreous. Top of head dark fuscous. Antennæ dark fuscous with light ochreous basal joint; second joint in the male enlarged with a deeply excavated notch. Thorax dark brownish fuscous. Patagia and extreme base of the forewings lighter, mixed with ochreous; rest of the forewing dark purplish fuscous, darkest towards the contrasting light base; a small round black dot on the middle of the cell and two similar black dots at the end of the cell; cilia light ochreous fuscous. Hindwings golden fuscous with cilia concolorous. Abdomen dark ochreous fuscous with lighter undersides and anal tuft. Legs light ochreous fuscous with heavy broad black bars on the exterior side and with the tarsi annulated with black. Alar expanse: 14 mm.

Habitat: Miami, Fla., E. R. Sasscer, Coll.
Type: Cat. No. 19233, U. S. N. M.
Bred from dry "mummy" fruit of Loquat, *Eriobotrya japonica*, hanging on the trees; moths issued early in July.

Sparganothis albicaudana n. sp.

Labial palpi light reddish ochreous. Face straw colored, apparently depressed, due to the projecting bright ochreous scales of the head. Antennæ ochreous with white upper side. Thorax and forewing brigh yellow, faintly reticulated with slightly raised lines of golden coppery scales; the female has a blackish brown oval spot on the middle of dorsal edge, faintly connected with a small costal spot at basal third by a light coppery, angulated line; from the middle of costa runs a more distinct, outwardly curved, coppery line across the wing to the dorsal edge just before tornus; extreme terminal edge light coppery; cilia yellow. The male has a small, dark reddish brown costal fold, covering only a sixth of the costa, and the dorsal and costal spots are much lighter colored than in the female

light bluish brown. Hindwings ochreous white. Abdomen white. Legs ochreous white without dark annulations. Alar expanse: ♀ 20 mm.; ♂ 17 mm.

Habitat: Notch, Pa.
Type: Cat. No. 19205, U. S. N. M.
Bred by the writer from leaftying larvæ on maple together with nearly allied, *Sparganothis pettitana* Robinson, which occurred in much larger proportions.

Spargonothis ferreana n. sp.

Labial palpi reddish ochreous, shaded exteriorly with reddish brown. Head light ochreous. Thorax reddish brown, with the posterior tip and the tips of the patagia yellow. Forewings rusty brown with light ochreous markings, made up of small oval spots, separated by veins of the ground color; the basal third of the wing is mottled in this pattern; another aggregation of ochreous spots occupy a large semicircle, resting on the middle of the costal edge; a third area of somewhat further separated ochreous spots occupies the apical fourth of the wing; only a broad dorsal blotch at apical third of dorsum with two oblique branches to costa show the unmottled brown ground color; cilia yellow. Hindwings silvery white with a ochreous tinge. Abdomen whitish ochreous. Legs whitish, shaded exteriorly with brown. Alar expanse: 21 mm.

Habitat: Ilion, N. Y., H. McElhose, Coll.
Type: Cat. No. 19234, U. S. N. M.
A striking species allied *S. reticulana* Clemens.

Tortrix (Cacœcia) lambertiana n. sp.

Labial palpi light reddish ochreous; second joint ascending, terminal joint short, porrected. Face, head and thorax light golden brown. Antennæ light brown with whitish annulations. Forewings light golden brown with silvery ochreous markings, which are edged with darker reddish brown, as follows: an indistinct, strongly angulated fascia from middle of costa to tornus, the lower half of which is nearly perpendicular and broken up into half a dozen spots by thin longitudinal crosslines of the ground color; perpendicular series of similar spots just before apex; all of these markings are in other fresh, bred specimens more or less obliterated by the ground color; cilia silvery white. Hindwings whitish ochreous with white cilia. Abdomen and legs dull ochreous. Alar expanse: 19 to 22 mm.

Habitat: Oakland, Oreg., P. I. Sergent, Coll.
Foodplant: Pinus lambertiana.
Type: Cat. No. 19235, U. S. N. M.
Closely allied to *Tortrix negundana* Dyar and allies, for which Meyrick retains the genus *Cacœcia* on the single character: ascending palpi, in difference from his conception of *Tortrix*, which

is restricted by him to the forms with porrected palpi; I am at present unable to maintain more than one genus.

Abrenthia new genus.

Labial palpi long, curved, smooth; second joint rather short; terminal joint twice as long as second; pointed, not flattened. Maxillary palpi rudimentary. Tongue well developed, curled. Antennæ half as long as the forewings, thick, smooth, with short joints and very short pubescence. Face, head and thorax smooth. Forewings elongate ovate, apex blunt, termen and dorsum evenly rounded, costa nearly straight to apical fourth; cilia short; 12 veins, all separate; 11 from near base; 2 from before the cell; 3 to 10 from end of the cell; internal vein from between 10–11 to between 7–8; 1 b. furcate at base; 1 c. present, but obliterated towards base. Hindwings as broad as the forewings, trapezoidal, costa and dorsum nearly straight, parallel; apex blunt, termen straight; tornus rounded; 8 veins; 8 free; 3 and 4 connate; 5, 6 and 7 somewhat approximate at base; cilia short. Posterior tibiæ smooth.

Type: *A. cuprea* Busck.

The genus is near to *Millieria* Ragenot, *Maclotica* Meyrick and *Glyphipteryx* Hübner, different from all of these in the smooth, nearly sickleshaped, pointed palpi with the terminal joint much longer than the second.

Millieria Ragenot has incorrectly been sunk as a synonym of *Porpe* (*Choreutis* Authors) by Meyrick; the latter genus must be restricted to the species with veins 3 and 4 coincident in the hindwings.

Abrenthia cuprea n. sp.

Labial palpi light golden purple. Antennæ purplish black. Thorax, patagia and extreme base of forewings dark bronze with strong metallic golden reflections. Forewings dark purplish blue with numerous thin, equidistant, longitudinal, whitish violaceous lines from base to apex; apical edge strongly metallic violaceous; cilia dark brown. Hindwings blackish brown with whitish cilia. Abdomen dark purplish brown with silvery underside. Legs dark brown with white tarsal annulations. Alar expanse: 11 mm.

Habitat: Roxboro, Pa., June, F. Haimbach, collector; Falls Church, Va., July, Carl Heinrich, collector.

Type: Cat. No. 19239, U. S. N. M.

A gorgeously colored little moth, unlike any North American species, reminding one of the South American genus *Maclotica* to which it is allied.

Coleophora acamtopappi n. sp.

Labial palpi light ochreous, whitish on the inner sides; second joint with small pointed tuft. Antennæ light ochreous without basal scale tuft.

Face and head whitish ochreous. Thorax light ochreous with two longitudinal white streaks; patagia ochreous with white edges. Forewings light golden yellow with three longitudinal white streaks; one broadly covering the costal edge, one through the middle of the wing, broad to the end of the cell, thence attenuated to apex and one narrow white streak along the dorsal edge, reaching only to the middle of the wing; cilia whitish ochreous. Hindwings dusky ochreous with whitish cilia. Abdomen ochreous fuscous with dark yellow underside and anal tuft. Alar expanse: 18 mm.

Habitat: Los Angeles, Cal., October, A. Koebele, Coll.
Foodplant: Acamtopappus sphærocephalus.
Type: Cat. No. 19240, U. S. N. M.

Closely allied to the other California species, *C. quadristrigella*, Busck, *C. entoloma* Busck and *C. accordella* Wlsm., but easily distinguished by the pattern.

Coleophora suædæ n. sp.

Labial palpi white, touched with yellow on the outer side of second joint, which has a small, pointed, projecting tuft. Antennæ slightly thickened towards base, but without tuft on first joint, light ochreous with narrow white annulations. Face, head and thorax light ochreous. Forewings light ochreous with ill-defined broad longitudinal white streaks, heavily dusted with dark brown; one such brown dotted streak lies below the costal edge on vein 12; four shorter parallel lines start at the edge of the cell and run to costa, the last one to apex; one line runs along the lower edge of the cell and one on the fold; none of the costal streaks reach quite to the costal edge, which is unmottled and brighter yellowish than the rest of the wing; cilia whitish ochreous. Hindwings and cilia light ochreous. Abdomen light fuscous with ochreous underside and anal tuft. Legs light ochreous; posterior tibiae with a longitudinal yellow line exteriorly. Alar expanse: 18 mm.

Habitat: Los Angeles, Cal., November, A. Koebele, Coll.
Foodplant: Suæda suffrudecens.
Type: Cat. No. 19241, U. S. N. M.

The case is cylindrical, but rather bulging, rough, made of the foodplant, light ochreous; mouth slightly deflected and cut off at 45 degrees; the posterior tip pressed together from three sides; length 10 mm.

This species is next to but distinct from *Coleophora acutipennella* Wlsm; it is very different from the other American *Coleophora* on *Suæda*, *C. suædicola* Cockerell, which is a much smaller white, black speckled species with a dark brown cigar-shaped case.

Coleophora manitoba n. sp.

Labial palpi white. Face, head and thorax white. Antennæ thickened and serrated with scales on basal half, white with dark brown annulations.

Forewings white sparsely dusted with black scales towards apex and with a small, deep black dot within the dorsal margin at apical third; cilia white. Hindwings silvery fuscous with dusky white cilia. Abdomen whitish. Legs white; posterior tibiæ dark brown exteriorly. Alar expanse: 13–14 mm.

Habitat: Aweme, Manitoba, N. Criddle, collector.
Type: Cat. No. 19242, U. S. N. M.
Cotype in the Ottawa Museum.

The species was bred from cases found on grass. The case is dark brown, made of silk with numerous small pieces of gravel incorporated; it is cylindrical with the head opening cut off nearly laterally to the case, without any neck; anal opening pressed together from three sides.

Marmara pomonella n. sp.

Second joint of labial palpi blackish brown with apex white; terminal joint white with an anterior black spot. Maxillary palpi whitish with black tips. Face, head and thorax in the specimen before me are badly rubbed, but apparently normally blackish brown. Forewings bluish black, shiny, with a large silvery white costal spot on the middle wing, another similar costal spot at apical third, and a silvery white fascia just before apex; cilia blackish with apical part silvery white. Hindwings dark fuscous with lighter fuscous cilia. Abdomen bluish black with silvery underside and anal tuft. Legs black with broad, silvery white annulations. Alar expanse: 8 mm.

Habitat: Corvallis, Oregon, H. F. Wilson, Coll.
Type: Cat. No. 19243, U. S. N. M.

Bred from larva mining just under skin of apple. The work and the larva of this species have long been known and have repeatedly been sent in for determination; the mine is figured in Bull. 10, new series, Division of Entomology, U. S. Dept. of Agriculture, 1898, page 88, fig. 19.

Marmara serotinella n. sp.

Labial palpi silvery white; second joint with a blackish brown apical annulation. Maxillary palpi dark fuscous. Face and front parts of the head silvery white; top of the head dark brown. Thorax blackish brown. Forewings blackish brown with silvery white markings; broad, triangular, white fascia at basal third is broadest on the dorsal edge and attenuated on the costal edge; oblique white fascia beyond the middle of the wing is thinner on the middle than at the edges of the wing; at apical fourth is a small white costal spot and opposite a similar dorsal spot; beyond this is a small white dash or a few white dots in the costal cilia; cilia dark fuscous. Hindwings dark brownish fuscous. Abdomen blackish brown above, underside and anal tuft silvery. Legs silvery white with dark brown annulations. Alar expanse: 6 mm.

Habitat: Falls Church, Va., C. Heinrich, collector.
Type: Cat. No. 19244, U. S. N. M.
Foodplant: Prunus serotina.

Exceedingly close to the type of the genus *Marmara salictella* Clem., but with less white ornamentation of the apical parts of the wing. The deeply serrated, typical larva makes long mines just under the epidermis of the branches of wild cherry characteristic of the genus.

Argyresthia castaneella n. sp.

Labial palpi golden white. Face and head pure white. Antennæ golden with brown annulations. Thorax white; base of patagia golden. Forewings white with a broad, bright, golden, longitudinal streak along costal edge, gradually widening from the middle of the wing into the darker, golden brown apical part, which is slightly reticulated with white; at the end of the cell is a darker golden brown spot, adjoining the dark costal part of the wing; on the middle of the dorsal edge is a similar dark spot; cilia white; forewings with veins 7–8 stalked. Hindwings dark fuscous with white cilia. Abdomen dark brown above, silvery white on the undersides with golden anal tuft. Legs silvery. Alar expanse: 10 mm.

Habitat: Falls Church, Va., May, C. Heinrich, collector; Hampton, N. H., June, S. A. Shaw, collector.
Type: Cat. No. 19245, U. S. N. M.

Very close to *Argyresthia subreticulata* Wlsm., but darker in color and differing by the dark dorsal spot in the otherwise pure white dorsal part of the wing.

Mr. Heinrich has bred this species from the bark of chestnuts, infested with *Sesia castaneæ* Busck.

Argyresthia franciscella n. sp.

Labial palpi, face and head yellowish white. Antennæ with white basal joint, with dark brown annulations. Thorax white. Forewings pearly white, dusted with light brown; an outwardly oblique blackish brown streak from basal third of dorsum is faintly continued to costal edge; a similar, parallel, brown streak from just beyond the middle of dorsum may likewise be faintly traced to apical third of costa, where it meets an ill-defined transverse fascia from apical fourth of dorsum; apical part of the wing strongly suffused with bronzy brown; cilia white with a few irregular, black dashes at base. Hindwings light fuscous with whitish cilia. Abdomen silvery white. Legs white with dark brown tarsal annulations. Alar expanse: 10 mm.

Habitat: San Francisco, Cal., May, E. O. Essig, Coll.
Type: Cat. No. 19246, U. S. N. M.

Easily distinguished from all the American brown marked species of the genus by the two dorsal dark streaks. Received from Mr. E. O. Essig with the label "in tips of Cypress."

Zelleria haimbachi n. sp.

Labial palpi, face and head pure white. Antennæ white with ill-defined, light brown annulations. Thorax white edged posteriorly and laterally with golden yellow; patagia golden yellow. Forewings light, golden yellow with a broad, central, longitudinal, white streak from base to apex; outer half of costal edge, apical part of the wing and cilia slightly dusted with black; cilia black. Hindwings silvery, whitish fuscous; cilia white. Abdomen silvery white mixed with light yellow, anal tuft pure white. Legs silvery white. Alar expanse: 12 mm.

Habitat: Wenonah, N. J., F. Haimbach, collector.
Type: Cat. No. 19247, U. S. N. M.

Bred from short needle pine by Mr. Haimbach after whom this striking little species is named. The species pupated June 31, and the imago issued July 17. The species reminds one in coloration and pattern of *Cerostoma* (*Abebæa*) *gerdanella* Busck.

Bucculatrix ilecella n. sp.

Face silvery white. Tuft and head white mixed with ochreous fuscous. Antennæ white with dark brown annulations; eyecaps white. Thorax and forewings white, suffused with light ochreous brown scales; two very ill-defined faint crosslines of blackish brown scales, one from the middle and one from apical third of costa obliquely outwards across the wing; three or four small groups of blackish brown scales on the fold; cilia white with dark brown basal line. Hindwings silvery fuscous with whitish cilia. Abdomen silvery fuscous above with silvery white underside. Legs silvery white, indistinctly barred with blackish brown exteriorly. Alar expanse: 4 mm.

Habitat: Victoria, Tex., July, W. D. Hunter, Coll.
Foodplant: *Ilex* species.
Type: Cat. No. 19248, U. S. N. M.

Probably the smallest species of this genus on record; it belongs in the *pomifoliella* group. Bred by Mr. Hunter from holly; the cocoons are pure white strongly longitudinally ribbed; typical of the genus, length 5 mm.

Incurvaria gillettella n. sp.

Labial and maxillary palpi dark brown, the former with bristles at the end of the second joint. Head rusty red. Antennæ blackish brown with white annulations. Thorax dark brown. Forewings dark brown with three silvery white, angulated fasciæ, the first from basal third of costa inwardly inclined and partly obliterated to near the base of dorsum; the second inwardly inclined from the middle of costa, sharply angulated on the cell and thence outwardly bent to apical third of dorsum; the third from apical third of costa, strongly inwardly curved, ending on vein 3, without attaining the dorsal edge. Cilia brown with white tips. Hind-

wings loosely scaled, semitranslucent, light brown with concolorous cilia. Abdomen and legs uniformly dark brown. Alar expanse: 25 mm.

Habitat: Silverton, Colorado, C. P. Gillette, Coll.
Type: Cat. No. 19249, U. S. N. M.

This is the largest described American species of this genus, nearest to *I. oregonella* Walsingham, but easily distinguished by the pattern.

Incurvaria itoniella n. sp.

Labial palpi yellowish white with a few black bristles; maxillary purplish black. Antennæ bronzy, blackish brown. Face and head light reddish yellow with a few scattered black hairs. Thorax and forewings unicolored dark greenish brown with strong bronzy reflections, and in some lights golden; cilia bronzy brown. Hindwings dark purple with scattered golden scales around the edges; cilia purplish brown. Abdomen and legs bronzy brown; posterior tibiæ with long silky whitish hairs above. Alar expanse: 11 mm.

Habitat: Kaslo, Brit. Columbia, J. W. Cockle, Coll.
Type: Cat. No. 19250, U. S. N. M.

Very similar in size and general habitus to our eastern *Euclemensia acerifoliella* Clemens, but differing generically and in the lighter, more greenish color; it is also somewhat more narrow winged.

The genus *Incurvaria* has been separated by Mr. Meyrick (Hand Book 1895) on the antennal ciliation in the male, and some of the European species as *I. capitella*, have on this ground been placed in the genus *Tinea*. This is another striking case, where the use of secondary sexual characters has caused curious mistakes in generic classifications; *I. capitella* and its allies are aculeates and hence do not even belong to the same family as the genus *Tinea;* the genera *Tinea* and *Incurvaria* may be best separated by the presence or absence of wing aculeation.

Incurvaria cyanella n. sp.

Labial palpi golden yellow. Antennæ black. Face and head light reddish yellow. Thorax dark bronzy brown. Forewings dark greenish and bluish bronzy brown overlaid with scattered metallic golden scales; cilia dark brown. Hindwings dark purplish brown with lighter brown cilia. Abdomen blackish brown Legs blackish brown. Alar expanse: 10 mm.

Habitat: Oak Station, Pa., F. Marloff, Coll.
Type: Cat. No. 19287, U. S. N. M.

Very close to the foregoing species *I. itoniella* Busck, but smaller, darker, more bluish in color and at once distinguished by the metallic golden scaling on the forewings.

Incurvaria cockerelli n. sp.

Second joint of labial palpi light yellow, terminal joint black. Tongue black. Antennæ black with silvery white tips. Face and head reddish ochreous. Thorax dark metallic green. Forewings dark greenish bronze, with strong metallic golden reflection; at apical third is a large, transverse, oval, light yellow spot, touching the dorsal edge and reaching nearly across the cell; underside deep blue, sprinkled with golden scales; cilia blackish brown. Hindwings deep purplish blue, with base of costal edge silvery fuscous and with cilia dark metallic brown. Abdomen dark bluish brown. Legs dark bronzy brown. Alar expanse: 11 mm.

Habitat: Long Peak and Peacefull Valley, Colorado, Prof. T. D. A. Cockerell, collector.

Type: Cat. No. 19288, U. S. N. M.

Named in honor of the collector, who continually adds interesting finds to the National Museum.

It is close to the following species, *I. sedella*, but larger, with darker head and with yellow, oval spot at apical third supplanting the transverse white fascia.

Incurvaria sedella n. sp.

Labial palpi yellow with black terminal joint and black setæ. Antennæ bronzy black with white tips. Face and head yellowish white. Thorax dark bronzy brown. Forewings dark bronzy brown with a white transverse fascia at apical third; cilia bronze. Hindwings dark purple with basal half of costa silvery white; cilia dark golden purple. Abdomen dark purplish brown. Legs silvery, shaded with dark purple. Alar expanse: 9 mm.

Habitat: Boulder, Colo., T. D. A. Cockerell, collector.

Type: Cat. No. 19289, U. S. N. M.

Taken by Prof. Cockerell on *Sedum*.

Prodoxus barberella n. sp.

Labial palpi brownish fuscous, touched with white. Maxillary palpi blackish fuscous. Antennæ blackish brown, dotted on the upper side of basal half with white and with white basal joint; ciliation in the male 1. Face, head and thorax white. Forewings white with blackish brown longitudinal markings as follows: costal third with short irregular longitudinal dashes, which towards apex form three more defined short lines, running obliquely to the costal edge; a large, longitudinal brown dash on the middle of the fold, a small one on the cell and a large one beyond the end of the cell; an approximate semicircular dorsal spot at apical third, an ill-defined series of marginal dark brown spots before the cilia; cilia white, dusky at apex and at tornus. Hindwings semitransparent with scant, hairlike, dark fuscous scales; cilia whitish fuscous. Abdomen blackish brown with whitish anal tuft. Legs dusky white. Alar expanse: 14–17 mm.

Habitat: Ray, Ariz., 4400 feet altitude, H. S. Barber, collector
Foodplant: *Agave palmeri.*
Type: Cat. No. 19290, U. S. N. M.

I am pleased to dedicate this interesting and pretty species to Mr. Barber who, on January 4, 1914, cut a tall dry flower stalk of the *Agave* in Arizona and brought it to Washington, where more than a hundred moths issued from it about the middle of March. The larvæ are glassy white with light brown head and dark brown mouth parts; they are, as is typical of the genus, entirely apodal, without any trace of thoracic legs or abdominal prolegs; length 12–14 mm.; before pupation they bore out to the surface of the stalk, leaving only a thin silk lined circular lid, which is pushed out by the pupa at emergence; the pupal shell is thin and flimsy and remains protruding from the exit hole.

The genus *Prodoxus* Riley has been incorrectly sunk as a synonym of *Tegeticula* Zeller (= *Pronuba* Riley) in the Biologia. The two genera are abundantly distinct in all stages; the larva of *Tegeticula* has thoracic legs, that of *Prodoxus* is apodal; the pupa of the former is strongly and characteristically spined, while that of *Prodoxus* is smooth, and the remarkably developed "Maxillary tentacle" in *Tegeticula* is represented in *Prodoxus* only by a slight protuberance.

RHABDOBLATTA BRUNNEONIGRA, A NEW COCKROACH FROM CHINA.

By A. N. Caudell, *Bureau of Entomology.*

Among a few miscellaneous Orthoptera from China recently received for determination from N. Gist Gee of Soochow was a large roach which, according to Shelford's keys, belongs to the genus *Rhabdoblatta.* The species is apparently a new one and the following description is therefore presented.

Rhabdoblatta brunneonigra n. sp.

A brownish black roach nearly one and one-half inches in length exhibiting the following characters: Head projecting somewhat from beneath the pronotum; eyes large and separated by a distance as great as twice the greatest width of the basal segment of the antennæ; ocelli large and as widely separated as the eyes; antennæ shorter than the body, the basal segment large and over twice as long as broad, the second slightly smaller and scarcely longer than broad, the succeeding ones gradually diminishing in diameter, those of the basal third or so transverse, beyond growing more elongate, those towards the apex slightly more than twice as long as broad. Pronotum about twice as broad as the head, the widest part slightly in advance of the middle, anteriorly very broadly rounded and posteriorly obtuse angulate, the disk with a pair of somewhat obscure shallow depressions on each side of the middle. Legs moderately stout, all the

femora armed beneath on both margins with three or four moderately stout spines; tarsi with distinct pulvilli, the basal segment, especially of the middle and hind legs, long and distinctly armed beneath, except on the apical fourth or fifth which is occupied by the pulvillus, with a double row of short sharp spinules; claws with moderately large arolia between them. Wings black, or nearly so, in the anterior half, the anal area very moderately fuliginous towards the outer margins, basally still less so; posterior ulnar vein many branched, some of the branches ending in the dividing vein; apically the wing is slightly undulate, being somewhat prolonged in the marginal area (fig. 1). Elytra far surpassing the tip of the abdomen, about as broad as the pronotum and about four times as long as broad, the sides subparallel and the apex subtruncate, being somewhat undulate as in the wing.

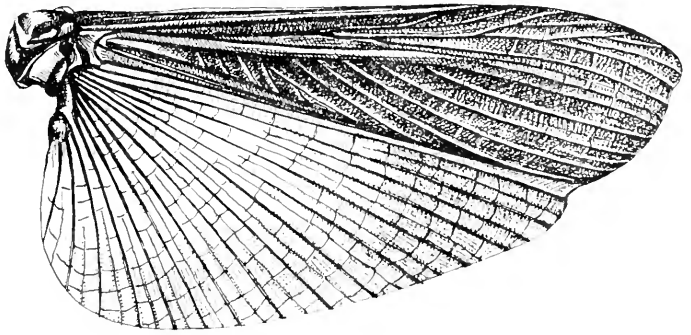


Fig. 1. Rhabdoblatta brunneonigra Caudell.

Abdomen with the subgenital plate entire and bearing a pair of short movable styles; supraanal plate mesially depressed longitudinally and apically notched; cerci moderately slender and surpassing the supraanal plate by more than one-half of their own length.

General color brownish black; head and pronotum black, the eyes and the ocelli light brown and the antennal scrobæ, the mesial portion of the clypeus and some of the palpal segments marked more or less with the same color. Legs black with the spines a little lighter and the tarsi yellowish. Abdomen blackish above, beneath black for the entire length mesially, laterally yellowish, the yellowish margins and black central stripe of subequal widths; cerci and styles and the whole of the subgenital plate blackish.

Length: pronotum, 6.5 mm.; elytra, 29 mm.; cerci, 3 mm.; width: pronotum at widest point, 7.5 mm.; elytra at middle, 8 mm.

Described from one female from Kuling Kiangsi, China, N. Gist Gee, collector.

Type: Cat. No. 19125 U. S. National Museum.

ON THE GENUS EXORISTOIDES COQ. (TACHINIDÆ).

By W. R. Walton, *Bureau of Entomology, Cereal and Forage Insect Investigations.*

In following the work of the late Mr. D. W. Coquillett in the Muscoidean flies, the fact soon becomes obvious to the student that he sometimes brought together under one generic name (often by means of artificial characters) several rather widely related forms. This indeed was his usual method of procedure where the material before him was meager and yet seemed of sufficient interest to merit description. I am personally in favor of this system because it obviates the danger of making unnecessary generic names and still permits the recording of the specific descriptions. These can usually be made broad enough to include any and all characters which may subsequently prove to be of generic importance.

The genus *Exoristoides*[1] Coq. is evidently of this character. Mr. Coquillett[2] has designated the species *johnsoni* as the genotype. Additional material of the other two recorded species has recently fallen into my hands. Specimens of *Exoristoides harringtoni*[3] Coq. collected at Plummer's Island, Md., by Dr. A. K. Fisher, and at Dead Run, Fairfax County, Va., by R. C. Shannon, show structural characters which demonstrate beyond a doubt that the species is not congeneric with the genotype.

The other species, namely, *slossonæ* Coq. seems doubtfully congeneric with *johnsoni* Coq., the shape of the third antennal joint is quite dissimilar, and the scanty setulæ of the first vein are sometimes missing in the male. When this occurs the species will run to *Exorista* in Mr. Coquillett's table. Whether or not the missing setulæ have ever existed is difficult to decide. But perhaps the species would better remain where it is for the present. The genus is characterized by Mr. Coquillett as follows:

"First vein partly bristly, frontal bristles descending below base of antennæ, vibrissæ on a level with front edge of oral margin, antennæ reaching lowest fourth of face, eyes distinctly hairy, head at vibrissæ distinctly shorter than at base of antennæ, sides of face bare, apical cell open, facial ridges bristly on lower fourth, third vein bristly more than half way to small crossvein." The following notes are made from the genotype: Apical cell ending in costa distinctly before wing tip, fifth vein destitute of setulæ

[1] Rev. N. Am. Tach., p. 31.

[2] Type species of the N. A. Diptera, p. 544.

[3] This species was originally designated as the type of a new genus in the present paper as read February 4th, but was anticipated under the generic name *Homalactia* Townsend in Proc. Biol. Soc. Wash., Vol. XXVIII, pp. 19–24, February 12.

beyond second basal cell, bend of fourth vein destitute of stump or wrinkle, fourth vein beyond the bend curved gently inward. The two species may be easily separated as follows:

First Vein with at most two or three widely separated setulæ on outer third, third joint of antenna black, gently concave on its front edge, arista shorter than third antennal joints (fig. 1–2), = *slossonæ* Coq.

First Vein bearing setulæ to the number of six or seven on its intermediate third only, third antennal joint in part yellow, gently convex on its front edge, arista longer than third antennal joint (figs. 3–4), = *johnsoni* Coq.

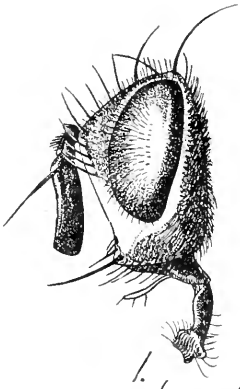
Homalactia Townsend.

Palpi present well developed (fig. 5); first vein thickly setulate on its outer two-thirds, third vein setulate to a point considerably beyond small crossvein, fifth vein bearing three or more bristles just beyond second basal cell (fig. 6); lower half of face on sides bare, frontal bristles strongly developed, descending to base of arista, the lowest ones curving upward (fig. 5); proboscis not longer than height of head, fleshy. Apical cell ending close to wing tip, either open or closed and short petiolate. Fourth vein bent violently inward beyond the bend which bears a short stump directly in line with the fourth vein before its bend. Third antennal joint subdentate on its lowest front corner. Ocellar bristles directed forward, head shorter at vibrissæ than at base of antennæ. Vibrissæ on oral margin; eyes thinly hairy; front tarsi of female distinctly dilated, hind tibiæ not ciliate.

Type: Exoristoides harringtoni Coq. (figs. 5–6).

In describing this unusually marked species[1] Mr. Coquillett had before him but one specimen which is at present in a poor state of preservation. It differs from the specimens before me in having the apical cell closed and petiolate. The original description of the type makes no mention of the presence of a row of several bristles on the fifth longitudinal vein near its base. The occurrence of these is a rare thing in the Tachinidæ. They are found in *Polychætoneura elyii* Walton, and *Chatoplagia atripennis* Coq. and in a few other genera. The latter fact was overlooked in my description of *Polychatoneura* but in no-wise affects its standing as *Chætoplagia* belongs to that group possessing a row of macrochætæ on the face.

[1] Proc. U. S. Natl. Mus., Vol. XXV, p. 110.



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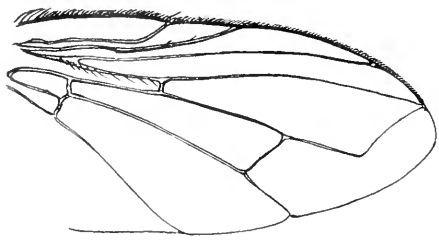

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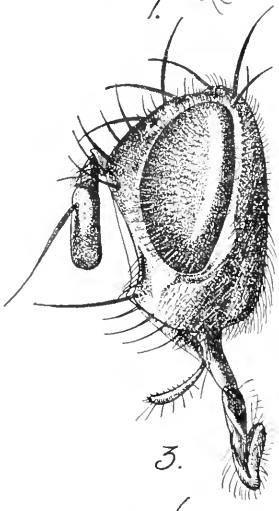

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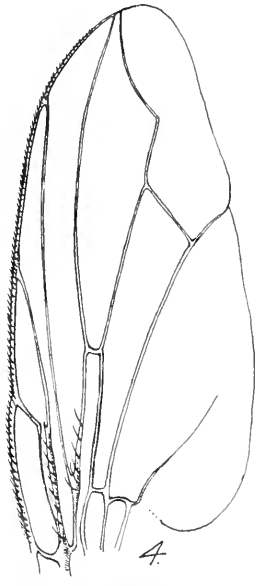

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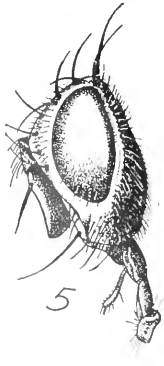

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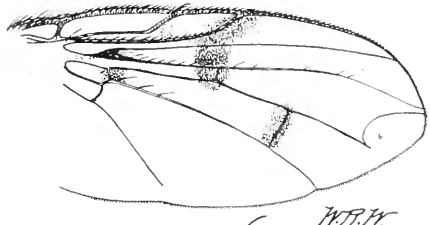

6. W.T.H.

EXPLANATION OF PLATE.

Fig. 1, *Exoristoides slossonæ* Coq.....head
Fig. 2, *Exoristoides slossonæ* Coq.....wing
Fig. 3, *Exoristoides johnsoni* Coq.....head
Fig. 4, *Exoristoides johnsoni* Coq.....wing
Fig. 5, *Homalactia harringtoni* Coq.....head
Fig. 6, *Homalactia harringtoni* Coq.....wing

MOSQUITOES ATTACKING A FROG.

BY R. C. SHANNON, *Bureau of Entomology.*

A bullfrog (*Rana catesbeiana*), was seen sitting upon a log in a swamp at Dead Run, Fairfax County, Virginia, May 23, 1915, and upon it were a number of mosquitoes which arose from his back in a small swarm when he moved at my approach. The mosquitoes returned as soon as the frog became quiet again and resumed their feeding. When first seen the frog appeared to be unaware of the blood-suckers. When nearer approach was attempted the frog jumped into the water leaving the mosquitoes behind. Four specimens were captured and these have been determined by Mr. Knab as *Culex territans* Walk.; their abdomens were distended and the imbibed blood showed through the integument.

Mr. Knab informs me that there has been considerable doubt that *Culex territans* sucks blood. In spite of the fact that the species is very common in the eastern United States and breeds everywhere in smaller collections of water, no definite feeding record of it has been made, and it has been doubted if it would attack man or other warm-blooded animals. The present observation suggests that the species may confine its attacks to frogs and perhaps other cold-blooded animals.

A NEW SPECIES OF THE GENUS SECODELLA.

By J. C. Crawford.

This interesting species was first reared by Mr. Marcovitch in 1913 when he secured a very few specimens, but during 1914 it occurred in large numbers and a fine series was sent to me for study.

The species of this genus are very striking in appearance due to the lines of cilia on the fore wing and also to the row of bristles on the under side of the wing just back of the marginal vein.

Secodella argyresthiæ n. sp.

Female: Length 3 mm. Deep purple with some greenish tints; face with a deep cross furrow in front of anterior ocellus; head with crowded fine punctures, those above cross furrow coarser; antennæ brown, scape and pedicel purple; first and second joints of funicle subequal in length, each about one and one-half times as long as the pedicel; third and fourth joints successively shorter, together about as long as the club; mesonotum with fine thimble-like punctures, those on the scutellum finer than on scutum; propodeum very short, with a median carina; wings hyaline, upper surface of fore wings with six rows of cilia, three from stigmal knob as follows: one running apicad and close to anterior margin of wing, touching anterior margin before apex of wing, one curving caudad and running to apical margin, one running diagonally across wing basad to rear of wing and forming the border of the non-ciliated basal area; two lines run from base of ciliated area to apical margin, one close to posterior border, the other some distance anteriad of the former; the sixth originating within the ciliated area and running to apical margin; lower surface of fore wings with a row of five or six long curved bristles close to marginal vein at about its middle; legs purple, anterior tarsi brown, middle and hind tarsi, except apices, whitish; abdomen elongate.

Male: Length 1.8 mm. Similar to the female.

Habitat: Ithaca, N. Y.
Host: Argyresthia alternatella.
Type: Cat. No. 19408, U. S. N. M.

Described from a series reared by Mr. S. Marcovitch, from whom it was received.

Actual date of publication, June 8, 1915.

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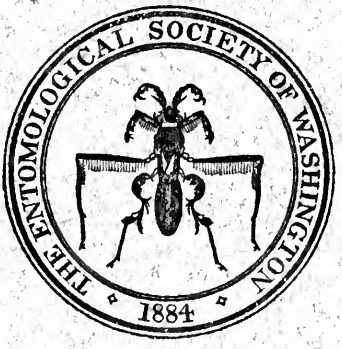

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The regular meetings of the Society are held on the first Thursday of each month, from October to June inclusive, at 8 P. M.

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVII 1915 No. 3

Two Hundred and Eighty-Fourth Meeting, March 4, 1915.

The 284th regular meeting of the Society was entertained by the married members at the Saengerbund Hall, March 4, 1915. There were present Messrs. Abbott, Baker, Barber, Cory, Crawford, Cushman, DeGryse, Ely, Gahan, Gill, Greene, Heinrich, Hunter, Hutchinson, Isely, Jackson, Knab, Kotinsky, McIndoo, Middleton, Popenoe, Quaintance, Rohwer, Rust, Sasscer, Schwarz, Shamon, Snyder, Townsend, Turner, Walton, Webb and Wood, members, and Messrs. J. M. Aldrich, F. W. Dry, Jacob Goldberg, H. G. Ingerson, A. C. Johnson and H. K. Plank, visitors.

Mr. E. L. Divens was elected a Corresponding Member.

The following papers were presented:

THE BERMUDA GRASS ODONASPIS.

By Jacob Kotinsky,

Branch of Forest Insects, Bureau of Entomology.

Shortly after arrival in Honolulu in 1904 I discovered this insect more or less heavily infesting Bermuda grass (*Cynodon dactylon*) or "Manienie," as it is called there. Its habitat is mostly underground but invariably on the stem, never on roots. Once discovered, it is quite conspicuous by its beautiful, chalky whiteness, and oyster shape. It is always lodged under the scale-like bracts at the node.

Bermuda grass is apparently the only grass in Hawaii suitable, and is practically the only grass used, for lawn purposes. It is also well adapted for grazing purposes, especially on the low lands, hence the insect depredation is of some economic value. It is fortunate, therefore, that this scale is kept in check, to a degree at least, by a parasite. This is a beautiful, tiny, metallic green chalcidoid new to science both generically and specifically, according to the late Dr. Ashmead.

The writer was certain at the time that the coccid was undescribed, and, though he had drawn up a description and prepared drawings, failed to publish it, in the contemplation of publishing a paper covering all the coccids of Hawaii, including descriptions of all species found there new to science. As often happens, this work was delayed until 1909. Meantime, the late Mr. Craw had occasion to refer to the insect in writing to Mr. Ehrhorn, who was then in California, and called it by my MS. name, and the latter incorporated it in one of his reports. In this wise the manuscript name got into print, but *sine* description. Meantime also, Mr. Bremner published in the Canadian Entomologist for 1908 a description of *Odonaspis graminis*, from grass in California, which was so similar to the species in question, that the author took them to be identical, especially since he received the assurance of Mr. Ehrhorn to that effect. It was therefore referred to by that name in Proc. Haw. Ent. Soc. II, 127. I have since been advised by Mr. Marlatt that the species is distinct. Mr. Sasscer, of the U. S. Bureau of Entomology was kind to supply me with the slide he prepared from material originally sent to the National collection of Coccidæ. These were used for the following description.

Odonaspis ruthae, n.sp.

Female scale: Oyster shaped or mytiliform when full grown, about 1.75 mm. long, 0.75 mm. wide; chalk white; *exuviæ* at elevated end, partly or entirely covered with white waxy dust which rubs off easily, straw colored. Ventral scale well developed, with dorsal completely enclosing and sealing insect. *Male scale:* Same shape, but only about half the size of female. *Adult female:* In balsam (fig. 1), irregularly circular; hyaline, except gland-bearing margin of last 7 or 8 segments, including caudal half of pygidium, and mouth parts, all of which are more or less heavily chitinized. Diameter about 0.63 mm. *Pygidium* (fig. 2) viewed from head toward median lobes looks like a very regular inverted outline of a bell, the median lobes corresponding to the tongue, 0.36 mm. long over all, 0.315 mm. wide at tips (of "bell"). Segmental sutures distinct half way cephalad from caudal margin. *Lobes:* 2 pairs, but slightly denser than chitinized margin, not very conspicuous. Median, narrow, parallel,

rounded caudad, but apparently united, actually separated, like rest of pygidial posterior margin enveloped in a filmy membrane, intervening space at base roundly emarginate, project but 10 μ caudad of main marginal line. Second pair but slight, triangular elevations on marginal line. *Incisions:* None.

Paraphyses: Fairly distinct at sutures of two last segments, somewhat clavate cephalad. *Plates:* None. *Spines:* One each side of median lobes, on dorsum and ventrum; also one dorsal at anterior end of segmental margin. *Anal opening:* Rather small, evidently posteriorly directed, circular, central within chitinized longitudinally oval area, about one-fourth length from base of pygidium. *Paragenitals:* 3 groups, the laterals elongate, apparently anterior and posterior group united. Anterior 12–17 glands; lateral 29–33. *Dorsal pores:* Very numerous, especially on more chitinized portions of

Fig. 1. Odonaspis ruthae. Contour of female.

Fig. 2. Odonaspis ruthae. Pygidium of female.

abdominal segments, arranged in more or less regular rows longitudinally. *Basal thickenings:* None. *Ventral thickenings:* None. Second stage described by author in paper above referred to.

Type: Material and slide in U. S. coccid collection No. 14089, from which this description is made.

This species is easily mistaken for *O. graminis*, but is quite distinct from it when slide preparations are compared. Among the more conspicuous differences are: the greater width of base of pygidium in our species; the dorsal pores and intersegmental sutures on the abdomen are much more distinct. Also, the median lobes of *ruthæ*, as indicated, are more separated, and the species is perceptibly smaller and more hyaline than *graminis*. Moreover, our species bears paragenital glands which do not occur in the other.

A specimen (slide) in the Bureau collection from New Orleans, La., on Bermuda grass (T. C. Barber) is in its pygidial characters absolutely identical with *ruthæ*, except that the entire body is considerably longer, being oval in outline (0.93 x 0.64 mm.). Paragenital pores in lateral groups more numerous. They may be specimens of this species grown under more favorable conditions.

The drawings were kindly made for me under my criticism by Miss E. Hart from Mr. Sasscer's photograph and slide.

A NEW AND INTERESTING GENUS OF NORTH AMERICAN TACHINIDÆ.

By W. R. Walton,

Bureau of Entomology, Cereal and Forage Insect Investigations.

Our knowledge of the muscoid parasites of grasshoppers in North America is gradually being enlarged. Some of the genera now known to have this habit are as follows:[1] *Sarcophaga, Ocyptera, Hilarella, Trichopoda, Heteropterina, Acemyia*, and I now add another, constituting a new and unique genus and species. The former I take great pleasure in proposing in honor of the late D. W. Coquillett whose valuable preliminary work in the superfamily Muscoidea is recognized by nearly all students.

Coquillettina, new genus.

Related to *Acemyia* Desv. Palpi small and slender, first vein bare, sides of face on lower half bare, proboscis shorter than height of head, eyes bare, lower front corner of third antennal joint bearing a projection, in the male pointing forward (fig. 1–a) in the female, downward and forward (fig. 3b) the lower edge distinctly notched. Eyes bare, front in

[1] I view with grave doubt the authenticity of the recorded rearing of *Frontina frenchii*, Will, from *Dissosteira carolina*, by Prof. Lugger in 1874 as published by Mr. Coquillett.

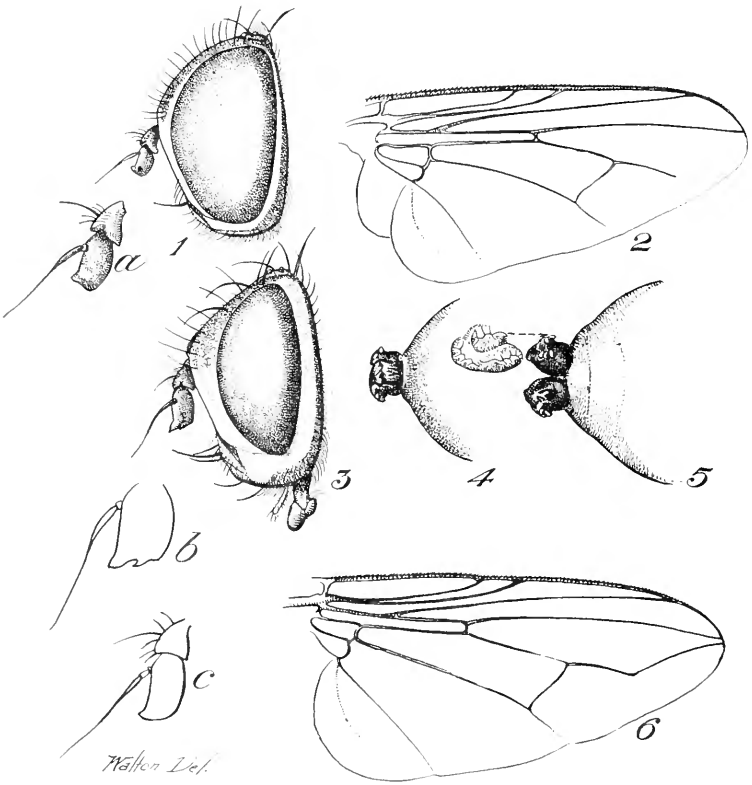
male very narrow, about one-third width of either eye, in female wider than either eye. Antennæ scarcely reaching to lower half of face, vibrissæ rather weak, situated at least the length of second antennal joint above front edge of oral margin. Facial ridges almost bare, only a few weak bristles on their lower fourth. Cheeks in male almost linear, in female not more than one-fourth eye height in width. Frontal bristles not descending below base of antennæ. Ocellar bristles directed forward. Wings (fig. 2) whitish hyaline, costal spine obsolete, fourth longitudinal vein absent beyond the bend, third vein ending in costa close to tip of wing, anal vein weak, not reaching posterior margin. Puparium with anal stigmata (fig. 4 and 5) projecting, knobbed, closely approximated.

Coquillettina plankii, new species.

Type, the following new species.

Male. Rather compact, entirely grayish pollinose, nowhere shining, length 6 mm. Head hemispherical, slightly wider than thorax, sides of front grayish pollinose, clothed with rather long fine erect hairs, orbits narrowly edged with silvery. Antennæ yellow, the outer side of third antennal joint brownish, same slightly longer than second joint (fig. 1–a). Arista brown, naked second joint not longer than broad. Genæ, posterior orbits and facial depression silvery pollinose. Frontal vitta brown, very narrow at vertex, widening at base of antennæ. All the macrochætæ of the head weak. Beard short and grayish in color proboscis and palpi yellow. Orbital bristles absent. Thorax and scutellum concolorous dark grayish pollinose. Four distinct vittæ, the inner pair narrow and becoming obsolete near middle of dorsum, the outer pair reduced to triangular spots before the suture and short narrow streaks posterior thereto. Postsutural dorso-central bristles three, sternopleurals two, which are scarcely distinguishable from the long pilose hairs surrounding them. Pleuræ cinereous pollinose. Abdomen ovate, cinereous pollinose, a dark circular spot surrounding each marginal abdominal macrochæta. All segments bearing marginals, no discal on any segment. Abdominal vestiture consisting of scattered coarse black recumbent hairs. Wings milky hyaline, veins yellowish. Legs, including coxæ, yellowish, the femora brownish on sides. Pulvilli whitish front ones as long as last tarsal joint, claws not greatly elongated.

Female. Similar to male except as noted in the generic description and as follows, two pairs or orbital bristles present, frontal vitta occupying nearly one-third width of front. Antennæ entirely yellow, third joint, about one and one-half as long as second. Pollen of superior orbit and front with a yellow tinge, posterior orbit about twice as wide as in male. Postvertical bristles well developed, nearly as long as ocellars. Abdomen missing in the unique specimen as are the legs with the exception of one front femur which is clear yellow in color. Pleuræ whitish pollinose, sternopleural plate almost naked, excepting the two sternopleural macrochætæ.



EXPLANATION OF PLATE.

Fig. 1. *Coquillettina plankii*, head of male; *a*, enlarged veiw of antenna.

Fig. 2. Wing of same.

Fig. 3. Head of female; *b*, enlarged outline of right antenna from inner side.

Figs. 4 and 5. Lateral and dorsal views of pupal, anal stigmata with detail showing irregular outline of slits.

Fig. 6. Wing of *Acemyia tibialis* Coq.; *c*, outline of antenna of same.

Described from one female and two male specimens, the former fragmentary. All reared (from a cage in which undetermined grasshoppers were confined) Aug. 8, 1914 at Pasadena, N. J., by H. K. Plank of the U. S. Bureau of Entomology, in whose honor this interesting fly is named. Type, a male, deposited in the U. S. National Museum, Washington, D. C. This species bears superficially a close resemblance to *Acemyia tibialis* Coq. but is obviously generically distinct. Nature apparently takes delight in demonstrating how closely she can approximate two entirely distinct forms.

REVISION OF MYIOPHASIA.

By Charles H. T. Townsend.

In 1891 the writer erected the two new genera *Phasioclista*, genotype *P. metallica* new species; and *Ennyomma*, genotype *E. clistoides* new species (Trans. Am. Ent. Soc. XVIII, 369 and 371). In the same year Brauer & von Bergenstamm erected the new genus *Myiophasia*, genotype *Tachina ænea* Wiedemann (1830) from Montevideo, S. A. (Muse. Schiz. II, 362). The latter authors misidentified Georgia specimens of *Phasioclista metallica* with *Tachina ænea*, as indicated by Wiedemann's description,[1] and gave therefrom what they considered to be a redescription of the latter species. They explicitly state in their text that they had Wiedemann's badly preserved holotype of *Tachina ænea* before them at the time, from which it results that their *ænea* is a composite species; and, if this be not sufficient for the genotype fixation of *Myiophasia*, their use of the words "Type Montevideo" after the name *ænea* would seem to fix that species as the genotype despite the misidentification principle involved.[2]

In 1892 the writer described three new species of this group under the names *Læwia globosa* (Ent. News III, 129), *Læwia ruficornis*, *Læwia nigrifrons* (Can. Ent. XXIV, 77), and *Clista americana* (l.c. 78), the last two being in all probability male and female of one species.

[1] The combination (in male) of deeply golden-rayed wings, yellow wing-veins and deep golden tegulæ, with strongly oblique crossveins, described by Wiedemann for *Tachina ænea*, does not occur in any of the North American forms seen by the writer.

[2] In order to place the genotype of *Myiophasia* beyond dispute, the composite species *Myiophasia ænea* Brauer & von Bergenstamm, 1891, Denkschr. Kaiserl. Akad. Wiss., Math.-Nat. Cl. LVIII (Muse. Schiz., II) 362, is hereby restricted to the species *Tachina ænea* Wiedemann, 1830, Aussereurop. Zweifl. Ins., II, 298, as represented by the Montevideo (South America) holotype.—C. H. T. T.

In 1897 the above five North American species, including the two new genera, were lumped by Coquillett under the name *Myiophasia ænea* Wiedemann, and not one of them belongs to that species (Rev. Tach. 50).

In 1905 Aldrich endorsed Coquillett's disposition of these five species, stating that he had examined the types and verified the synonymy in each case, and commented on what he considered the description of the same species "several times under different genera, or in the same genus," intimating the folly of attempting to draw descriptions too closely in these flies and pointing out this as the worst example of the kind committed by the present writer (Cat. Dipt. N. A. 420, 421 and 427). Such is the history in brief relating to the celebrated case of *Myiophasia ænea*.

The writer implied in 1908 that the last word had not yet been said on this case, stating that several well-marked forms have been confused here, and described a sixth new North American species of the group under the name *Myiophasia setigera* (Tax. Musc. Flies 56). He has now completed a study of the external adult characters of all the forms of the *Myiophasia* group represented by material in the U. S. National Museum collection, comprising 164 specimens. The results of this study are the selection of *Lœwia globosa* and *Lœwia nigrifrons* to serve as genotypes of the two new genera *Eulœwia* and *Ennyommopsis* respectively, and the validation of both *Phasioclista* and *Ennyomma* and their genotypes. While the genus *Myiophasia* can not be positively determined in the absence of material from Montevideo, it appears probable that the above species *setigera* from western North America may belong to it, and the species is provisionally referred thereto.

The following synoptic table will serve to separate the five genera and various subgenera, species and subspecies of this group, which forms a natural tribe on the borderline between the Dexiinæ and Megaprosopinæ. Every one of the 164 specimens in the U. S. National Museum collection can be quite readily determined by it with the exercise of a little care.

SYNOPSIS OF NORTH AMERICAN MYIOPHASIINI.

1. Apical cell ending in or very close to exact wingtip, normally closed; axis of hind crossvein strongly oblique to that of apical crossvein, in middle between small crossvein and bend of fourth vein or nearer to former; eyes of male normally thickly pubescent, those of female very thinly and inconspicuously so but the hairs always visible....2

Apical cell ending conspicuously before exact wingtip, usually open; axis of hind crossvein nearly or quite parallel with that of apical crossvein..... 4

2. Abdomen much longer than broad, both sexes with a median marginal pair of macrochætæ on second segment, usually marginal row of evenly-placed macrochætæ on third segment, all macrochætæ decidedly strong; cheeks nearly one-half eye-height in both sexes; front prominent in both sexes, the parafacials broad and usually polished in male; eyes of male usually not contiguous, the frontalia normally visible between them; female front at vertex little less than one eye; wings of male normally strongly tinged throughout with deep fuscous-golden, those of female for most part clear; apical cell normally ending in exact wingtip, never petiolate, practically always closed in male, often narrowly open in female; insertion of hind crossvein nearly in middle in both sexes; claws of male normally very elongate and lower border of head usually bulged behind eyes; parafacial hairs outside marginal row usually vestigal in female, well developed in male; male with soft blue-black coat over parafrontals, mesoscutum, scutellum and first two abdominal segments, leaving rest of abdomen and broad median vitta of first and second segments metallic dark green, female without such coat. . . . Ennyommopsis (new genus) *nigrifrons*

Abdomen scarcely longer than broad, female without median marginal pair of macrochætæ on second segment; third segment never with an evenly-placed row but only with a median and two lateral marginal pairs, all macrochætæ decidedly delicate; cheeks hardly one-third eye-height in both sexes; parafacials never polished and always comparatively narrow, the front normally not prominent but very sloping in both sexes; eyes of male normally contiguous, the frontalia not showing between them; front of female at vertex much less than one eye; wings nearly clear in both sexes, apical cell normally ending slightly before exact tip and often short-petiolate especially in male; lower border of head not bulged behind eyes, parafacial hairs usually marked in both sexes. 3

3. Insertion of hind crossvein in male normally conspicuously nearer to small crossvein than to bend of fourth vein, in female usually more nearly in middle; parafacials comparatively very narrow; claws of both sexes nearly equal; soft blue-black coat of thorax showing on first two abdominal segments in male, not in female.

Eulœwia (new genus) *globosa* (Subgenus A)

Insertion of hind crossvein nearly in middle in both sexes; front in both sexes sloping but subprominent, the parafacials considerably broader than in preceding; claws of male rather elongate; soft blue-black coat of thorax scarcely showing any tinge on first two abdominal segments in either sex.

Eu'œwia madrensis new species (Subgenus B)

4. Eyes of both sexes absolutely bare of hairs; apical cell well open; eyes not contiguous in male, the frontalia visible between them; female front at vertex conspicuously less than one-third head-width. 11

Eyes of male normally thickly pubescent, those of female less thickly so, but hairs always easily visible in both sexes; eyes practically contiguous in male, usually obliterating the frontalia at point of contact; female front at vertex fully one-third head-width or considerably more 5

5. Abdomen pollinose in whole or part 6

Abdomen without pollen, wholly glabrous; both sexes normally with median marginal pair of macrochætæ on second segment 8

6. Female without and male with median marginal pair of macrochætæ on second segment 7

Both sexes with such pair; parafacial hair rows well developed in both sexes....*Ennyomma robusta* subsp. *madera* new subspecies (Subg. A)

7. Apical cell normally closed; front in both sexes very prominent, antennæ inserted high; parafacial hairs normally vestigal in female; frontalia, antennæ and palpi dark.

Ennyomma robusta mexicana new name for *Myiophasia robusta* Walton, 1914, Proc. U. S. N. M. XLVIII. 179 (nec Coquillett, holotype, 1897, Rev. Tach. 51)—(Subg. A)

Apical cell narrowly open; front of male not prominent; parafacial hair rows well developed; frontalia, antennæ and palpi light reddish or yellowish ..... *Ennyomma robusta* (Subg. A)

8. Front of male not prominent; head not bulged behind below eyes; marginal row of macrochætæ of third abdominal segment closely placed 9

Front of male prominent, the parafacials much widened; head bulged behind below eyes; marginal row of third segment not closely placed 10

9. Insertion of hind crossvein nearer bend of fourth in both sexes; palpi and third antennal joint black or blackish .....
Ennyomma clistoides (Subg. A)

Insertion of hind crossvein in middle in male, nearer bend in female; antennæ wholly rufous ..... *Ennyomma ruficornis* (Subg. B)

10. Parafacials, parafrontals and mesoscutum cinereous pollinose; median marginal pair of macrochætæ of second segment weak in male, varying in female from absent through weak to well developed; palpi black or blackish.

Ennyomma clistoides subsp. *mesensis* new name for *Myiophasia setigera* Walton, 1914, Proc. U. S. N. M. XLVIII. 179 (nec Townsend, 1908, Tax. Musc. Flies—Smiths. Misc. Coll. LI. 56)

Parafacials parafrontals and mesoscutum silvery-white pollinose; median marginal pair of macrochætæ of second segment strong in

both sexes; palpi rufous; front usually still more prominent than in preceding....*Ennyomma elistoides* subsp. *sierricola* new subspecies

11. No strong median marginal macrochætæ on second segment in either sex; hind crossvein of male in middle between small crossvein and bend of fourth vein, that of female a little nearer bend; hairs of parafacials outside marginal row normally vestigial, and marginal row weakly developed; third and fourth abdominal segments with marginal row of equally strong macrochætæ.

Phasioclista metallica

Strong median marginal pair on second segment in both sexes; hind crossvein much nearer bend of fourth in both sexes.....12

12. Hairs of parafacials normally well developed, especially marginal row; marginal row of macrochætæ of third segment often not of equal strength, due to partial development of extra bristles; face, third antennal joint and palpi except tips black.....*Myiophasia setigera*

Bristles and hairs less developed on parafacials and abdomen; antennæ, palpi and face wholly rufous.

Myiophasia setigera subsp. *oregonensis* new subspecies

It is highly important to separate and recognize the above forms by reason of their value in geographic ecology. Those who lump them ignore their true significance and are blind to the import of ecologic and evolutional principles. The impress of the environment is upon each of them. When, in the course of time, a series of some thousands of specimens shall have been secured, representing all the forms of this group occurring in the principal ecologic centers of North America, the variation in the environmental stamp exhibited by the series will furnish us a most instructive lesson in muscoid ecology. As large series as possible should be gathered from every variety of habitat. Such plastic forms as the present, by virtue of the very conditions which make them so difficult to classify, are of far greater biologic importance than those which show little change over wide ranges of territory or throughout continental areas. It therefore goes without saying that we should miss the kernel of biological investigation, and secure only the chaff, were we to yield to the easier alternative of lumping them.

The following is the distribution of the 164 specimens studied, to which are added published records of material not in the U. S. National Museum collection, with character of biogeographic environment for each form:

ENVIRONMENTAL AND GEOGRAPHICAL DISTRIBUTION.

Myiophasia setigera—2 males, Beulah (8,000 ft.) and Pecos, New Mexico (Cockerell); 2 females, Rociada and Santa Fe,

New Mexico (Cockerell)—Transition of the southern Rocky Mt. region, invading the edge of the boreal and also the edge of the arid upper austral; holotype from Beulah, which is in the edge of the boreal.

Myiophasia setigera oregonensis—2 females, Corvallis, Oregon (Cordley) and Ormsby County, Nevada (Baker)—Transition of the Sierra Nevada region on the borders of the boreal; holotype from Corvallis, Oregon.

Type: Cat. No. 19574 U. S. N. M.

Phasioclista metallica—2 females, Georgia (Morrison); 3 males and 1 female, South Carolina (Conradi and Townsend); 1 male and 1 female, Maryland (Shannon)—Described from 2 males, Carlinville, Ills., and Inverness, Florida—2 specimens recorded as reared by Forbes in Illinois (Psyche, VI. 467)—Humid lower austral, reaching Chesapeake Beach, Md., and middle austral of Illinois on north, and invading the semitropical of Florida on south; distinctively lower austral.

Ennyomma clistoides—2 males, Onaga, Kansas and Denton, Texas (C. R. Jones)—Described from 1 male, Carlinville, Ills.—Humid middle to lower austral prairie region. The Kansas and Texas localities are on the 96th and 97th meridians respectively. Also a male recorded from Brookings, So. Dakota, in same region (Can. Ent. XXIV. 78).

Ennyomma clistoides mesensis—29 males and 9 females, Koehler, New Mexico (Walton)—Arid upper austral.

Type: Cat. No. 19615 U. S. N. M. (Male).

Ennyomma clistoides sierricola—9 males and 17 females, Las Visayas and San Pedro de Madera in the Sierra Madre of Chihuahua, 7,000 to 8,000 ft. (Townsend)—Transition of the northern Sierra Madre region.

Type: Cat. No. 19617 U. S. N. M. (Male).

Ennyomma robusta—1 male, Los Angeles County, California (Koebele)— Humid patches in arid semitropical lowlands of the Pacific coast.

Ennyomma robusta madera—2 females, San Pedro de Madera in the Sierra Madre of Chihuahua, 8,000 ft. (Townsend) and Mexico City (O. W. Barrett)—Transition of the northern to central Sierra Madre region.

Type: Cat. No. 19668 U. S. N. M. (S. Pedro de Madera).

Ennyomma robusta neomexicana—4 males and 5 females, Koehler, New Mexico (Walton); 1 male and 1 female, Mexico City (O. W. Barrett)—Arid upper austral plains and high plateau south.

Type: Cat. No. 19669 U. S. N. M. (Male, Koehler N. M.).

Ennyomma ruficornis—4 males and 1 female, White Mts., N. H. (Morrison)—Described from 1 male, Southern Michigan.

—Boreal of the northern Appalachian region extending through the transition to the dilute edge of the upper austral prairie—2 subspecies indicated.

Ennyommopsis nigrifrons (Syn. *Clista americana* T. female)—1 male, Miami, Florida (Mrs. C. H. T. Townsend); 2 males, South Carolina (Townsend); 5 males, Maryland and Virginia (Crawford and Shannon); 1 male (TD4394) Holyoke Gap, Massachusetts (Townsend); 2 females, Florida and Missouri (Riley); 1 female, Missouri (Bureau Entomology) labeled "Par. on hickory nut Curculio, 7.22.95;" 1 female, Ruston, Louisiana (Hunter No. 1456)—Described from 1 male and 1 female, Carlinville, Ills.—Humid semitropical to austral and sparingly transition lowlands; lower austral in the main.

Eulœwia globosa—1 male, Inverness, Florida (Robertson No. 12417), 4 males, Missouri (Riley), 2 labeled "3090. x" and 1 "3090.o;" 1 male and 1 female, Opelousas, Louisiana; 1 female, Louisiana (H. A. Morgan) labeled "From Chalcodermus;" 11 males and 5 females, Clemson, South Carolina (G. G. Ainslie) reared from *Chalcodermus æneus* (TD511 female, 1710 puparia); 9 males and 9 females, Louisiana, Arkansas and Ada, Oklahoma (Hunter Nos. 1326, 1331, 1390, and 1934), mostly reared from *Anthonomus grandis* but also from other weevils; 2 males, Rio Piedras Verdes in the Sierra Madre of Chihuahua (Townsend) and Chinandega, Nicaragua (Baker); 2 females, Tifton, Georgia (Morrison) and Maryland (Coquillett); 1 female (TD4291), Oak Grove, Virginia (Townsend)—Described from 1 male, Florida; also 1 female (TD509) recorded, White Springs, Fla. (Townsend)—Humid semitropical to middle austral, reaching edge of transition of Sierra Madre region north and south.

Eulœwia madrensis—3 males, Colonia Garcia, Rio Piedras Verdes and San Pedro de Madera in the Sierra Madre of Chihuahua, 7,000 to 8,000 ft. (Townsend); 2 females, Las Visayas in the Sierra Madre of Chihuahua, 7,000 ft. (Townsend) and Mexico City (O. W. Barrett)—Transition of the northern to central Sierra Madre region.

Type: Cat. No. 19670 U. S. N. M. (Male, S. Pedro de Madera.)

NOTE ON BIOGEOGRAPHIC ZONES.

For purposes of geographic ecology, the following main life zones will be found most convenient and have been used in the present paper:

1. Boreal—Humid mountain areas of cool coniferous forest, mainly spruce, fir, aspen, etc.

2. Transition—Humid mountain areas of open pine forest.

3. Upper austral—Humid lowlands and prairies east of the 100th meridian in North America, and arid plains and mesas west of the same meridian terminating in the plateau of south-central Mexico.

4. Middle austral—Same classification as preceding and just south of it or below.

5. Lower austral—Classified same and south of preceding or below it in altitude.

6. Semitropical—Practically all humid lowlands in the east and arid lowlands in the west, but rising on the humid eastern mountain slopes and arid western mountain slopes within the tropics of North America. Includes all of the Florida mainland and what has been known as the Gulf strip of the lower austral. Preëminently a citrus-fruit region, severe frosts being rare but not unknown.

7. Tropical—Humid to arid lowlands and hills where frost is absolutely unknown. Distinctively a cocoanut and royal palm region.

The above definitions are given because they involve some modification of the usually accepted classification.

The main mountain regions of North America are classified in 4 groups: I—Appalachian (the whole eastern system); II—Rocky Mts. (West Texas to Athabasca and Alaska); III—Sierra Nevada (South California to British Columbia including Coast ranges); IV—Sierra Madre (Chihuahua to Central America).

A REMARKABLE NEW GENUS OF CEPHIDÆ.

By S. A. Rohwer,

Branch of Forest Insects, Bureau of Entomology.

The new genus described below is very remarkable because it possesses family characters of two families—Cephidæ and Xiphydriidæ.

The following important group characters of this genus are listed under the family with which they would ally it.

CEPHIDÆ.	XIPHYDRIIDÆ.
Adult.	Adult.
Thorax	Palpi
Basal part of abdomen	Antennæ
	Long malar space and ventral elongation of cheek
	Wings
	Lengthened 8th tergite
	Ovipositor
	Larva (?)

In all but one of the more recent classifications of the Chalastogastra this genus falls in the family Cephidæ. In the classification proposed by MacGillivray[1] which is based on wing venation, it falls in the family of Xiphydriidæ.

As the characters in which this genus is like the Cephidæ are less subject to modification by use they indicate that it should be placed in the Cephidæ and that the Cephidæ are the progenitors of the Xiphydriidæ.

Syntexis, new genus.

In Konow's classification in the Genera Insectorum, this genus falls in the Cephini and runs satisfactorily to the genus *Ateuchopus* Konow from which it may be separated by the filiform antennæ and peculiar venation.

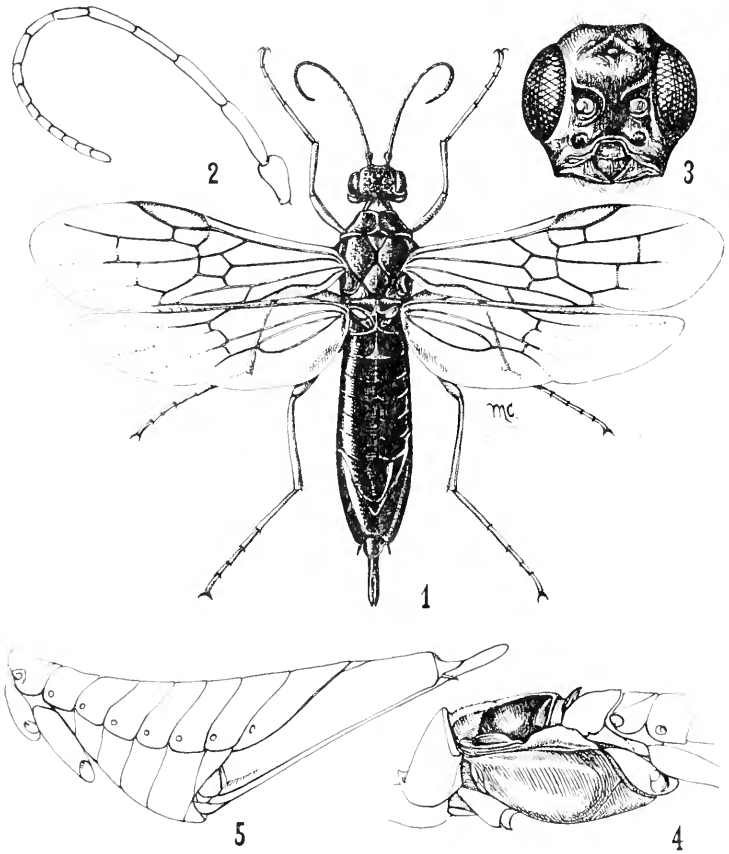
Head seen from above subquadrate, the posterior orbits less than half the cephal-caudad diameter of the eye; occiput immargined; malar space long, slightly greater than the width of mandible at base; cheeks produced ventrally; maxillary palpi long, 6-jointed; labial palpi 3-jointed, short, the apical joint as long as first and second, antennæ 16-jointed, second and third joints subequal, the apical joints filiform; pronotum transverse, posterior margin straight with a narrow median emargination; mesosternum with two accessory sutures which separates off a diamond-shaped plate, posteriorly; mesopostnotum large; metanotum separated from the metapostnotum which is fused with the anterior margin of the first tergite; metepisternum and metepimeron elongate, about of equal size, the metepimeron indistinctly fused with the side of the first tergite; posterior coxæ contiguous; tibiæ without supra-apical spurs; claws simple; tergites not margined laterally; the ninth tergite long as in *Xiphydria*, but truncate before the apex and produced beyond the truncation; ovipositor very like *Xiphydria;* subcosta distinctly removed from the costa; radial cell incomplete; stigma hyaline medially; basal vein joining first cubital cell at about the middle; second recurrent received in the second cubital cell, the first recurrent interstitial; transverse median of the fore wings received slightly basad of the middle of first discoidal cell; lanceolate cell with an oblique cross vein and contracted basally; hind wings typical of the Xiphydriidæ except the two discal cells are not defined and the apical veins are obsolete.

Type: The following new species.

Syntexis libocedrii, new species.

Female. Length to the apex of the abdomen 8 mm.; length of the ovipositor beyond the tip of the abdomen 1.5 mm. Clypeus truncate; supraclypeal foveæ deep, punctiform; head with large irregular punctures which are more distinct and better defined on the frons; median fovea represented

[1] Proc. U. S. Nat. Mus., vol. 29, 1906, p. 569-654.



EXPLANATION OF PLATE.

Syntexis libocedrii Rohwer. 1, Adult female; 2, antenna of female; 3, front view of head; 4, lateral view of thorax; 5, lateral view of abdomen. (Drawings by Miss Mary Carmody.)

by a very shallow impression; ocellar basin triangular, open below; facial quadrangle wider than high; pronotum subopaque with sparse tubercles; mesonotum similarly sculptured; mesepisternum and sternum shining, under high magnification, very finely reticulate; tibiæ and tarsi with weak short spines; abdomen shining; sheath nearly parallel-sided, obtusely rounded apically. Black; mandibles and palpi piceous; inner orbits below antennæ, posterior orbits behind the eye, posterior margin of the pronotum laterally and tergites 2 to 8 on lateral posterior margin, *greenish white;* legs beyond the coxæ rufo-testaceous; wings hyaline, slightly milky; venation pale brown anteriorly, pallid posteriorly.

Rose Camp, California. Described from two females recorded under Bureau of Entomology, No. Hopk. U. S. 4996*a* which refers to a note stating that these specimens were reared from larvæ and pupæ collected in the cells near the outer surface of the wood of a large incense cedar (*Libocedrus decurrens* Torr.). Material collected August 8, 1913, and reared June 22, 1914, by H. E. Burke.

Type: Cat. No. 19162, U. S. N. M.

Two poorly preserved larvæ are available for study but they are not in good enough condition to satisfactorily describe. However, as they appear to lack the cerci which occur on the apical sternite below the anal orifice, and have the antennæ more like the Xiphydriidæ it is probable that they are more like the larvæ of the Xiphydriidæ than the Cephidæ.

COMMENSALISM IN DESMOMETOPA.

(*Diptera; Agromyzidæ.*)

By Frederick Knab, *Bureau of Entomology.*

The small flies of the genus *Desmometopa* have been repeatedly observed under circumstances which indicate a remarkable specialization in habits. There are now on record a series of observations, made independently in widely separated parts of the globe, which all show that these flies feed upon the juices of freshly killed insects; however, unable to themselves kill their prey, they depend upon various rapacious arthropods, with whom they appear to live in more or less close association.

The Hungarian naturalist Ludwig Biró is responsible for the first and at the same time most remarkable observation in this connection. He observed a species, *Desmometopa minutissima*,[1]

[1] Described as an *Agromyza* by Van der Wulp and so recorded by Banks (Entom. News, xxii, 196; 1911). Mik, in the article quoted in the following, has referred the species to its proper genus.

in New Guinea resting in pairs on the back of an asilid fly, *Ommatius minor* Dol. "They sat on the back of the large fly, between the wings, back to back, so that one of them faced toward the head of the robber-fly and the other toward the abdomen." That their occurrence in this manner was not accidental, Biró determined by further observations. In eight additional cases he found the small flies, as before in pairs and back to back, upon the thorax of the asilid.[1,2] This strange association of these minute flies with the large robber-fly appeared quite mysterious without further knowledge of the habits of the genus. Shortly afterward Joseph Mik, in Austria, found a little swarm of *Desmometopa m-atrum* upon the body of a freshly killed worker-bee dangling on a spider-thread. The bee apparently had been just killed by a spider and the little flies, thirteen in number, were eagerly probing about on the body of the bee, pushing their horny probosces among the body-hairs and in particular probing about the roots of the wings. Mik observed them in their occupation for fully fifteen minutes, before gathering them in, and compared their behavior to that of vultures about a cadaver.[3]

The explanation naturally suggested by this second observation is that the *Desmometopa* found riding on the back of the robber-flies by Biró through this association assured themselves of suitable food. Later observations, made by Biró during a short stay at Amboina, confirmed this conclusion. It seems worth while to give his interesting account in his own words, and to let his other observations on the subject follow.

"In the afternoon hours I withdrew into a young woodland, where first of all *Ommatius minor* caught my eye, as it fluttered before me from one dry twig to another. Naturally from now on I gave it my undivided attention.

"From a distance of a few paces we had taken sharp cognizance of each other. The *Ommatius* was not resting empty-handed, but held between its claws the dead body of a trigoniid cricket; I could not detect his riders. Although quite close, I nevertheless took out my opera-glasses and began to observe him through them. Thereby I found at once the solution to this apparently strange association. I immediately detected the *Agromyza* [=*Desmometopa*], and moreover three of them, as they were probing about the prey. *Agromyza minutissima* is therefore the

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[1] Kertész, Koloman. Új-Guinea Légy-Faunájából. Dipterologisches aus Neu-Guinea. Termesz. Füzetek, vol. 20, p. 611–613. 1897.

[2] Biró, Lajos. Asilida és lovasa. Rovart. Lapok, vol. 4, p. 129. 1897.

[3] Mik, Josef. Merkwürdige Beziehungen zwischen Desmometopa M-atrum Meig. aus Europa und Agromyza minutissima v. d. Wulp aus Neu-Guinea. Wien. Ent. Zeit., vol. 17, p. 146–151. 1898.

commensalist of *Ommatius minor!* The insects hopped nimbly about the body of the cricket, stopped to feast, ran up onto the back of the robber-fly and again descended to the branch, ran and flew rapidly about, and could not rest for a minute.

"It still remained for me to check the correctness of my observations. Afterwards I amused myself for hours, partly with these first associates, partly with others found in these woods, where *Ommatius* was far from being a rarity. * * *

"In the woods of Amboina I captured the whole of one of these partnerships, then first released the *Agromyzas*, and afterward the *Ommatius*. It was easy to recapture the robber-fly, as it soon settled again at a distance of fifteen or twenty paces, and, although now more shy, I could, with sufficient patience and equipped with a long-handled net, recapture some individuals three or four times. To my astonishment the little flies had again all congregated upon its back.

"I still wanted to determine whether these were always the same individuals of *Agromyza*. For this reason I drove a specimen into the tip of the net and with the forceps tore a minute piece from its wing; made recognizable in this manner, I perceived that it came back twice, although upon the second instance I had released it at a distance of ten or twelve paces. Afterwards I facilitated the experiment by simply tethering the *Ommatius* to the end of a twig.

"However, not every *Ommatius* has its companion flies; many forage about without them. Some harbor only one, some two or three flies, but never more.

"The fidelity of the *Agromyza* is praiseworthy. It does not easily change its host. I tethered some robber-flies caught flying about unaccompanied to a branch and then released near them some of the little flies whose host I had killed. All scattered and none adopted the host selected for them."

As will be seen from the foregoing, Biró was not aware that the flies he had found associated with *Ommatius* belong to the genus *Desmometopa*, but they reminded him vividly of the *Desmometopa* which he had observed repeatedly in southern Europe. When collecting he had never found *Desmometopa* alone, but always about the prey of some predaceous insect that had just captured a bee, wasp, fly or butterfly. He was first of all impressed by the fact that these little flies showed no fear of spiders, but, on the contrary, boldly participated in their meals. Later he often saw them associated with flower-inhabiting spiders (*Misumena* and *Thomisus*), as well as with Asilidæ.

"Most frequently I found them in the region of Fiume and Buccari at the time when *Paliurus aculeatus* blooms. The flowers

harbor the large predaceous bug, *Harpactor iracundus*, which commonly hunts the workers of *Apis mellifica*. The pollen and sweet juices covering its body attract many *Desmometopa m-nigrum*. As long as *Harpactor* lies in wait, no flies appeared; but as soon as the table was set, they immediately gathered about. It appeared to be their determination to feast only in the presence of the hunter, for when I had removed the *Harpactor* I offered them the body of the bee in vain; none came to it. But I succeeded in deceiving them by placing beside the bee the killed bug. Furthermore, they must have a good sense of smell, for a dried *Harpactor*, or one killed some hours previously, failed to attract them.

"At Singapore I met with *Desmametopa* flies again in April of this year. One night I collected a nest of *Apis florea* Fab., var. *andreniformis* Sm. with its entire inhabitants, and from the following noon on single small flies came flying to the dead bees and the cells laid out to dry. They were easily recognizable by the M-shaped mark on the frons and in their movements and manner of flight behaved entirely like their European relatives."[1]

This last observation induced Biró to incline to the belief that the European *Desmometopa* also might be attracted, if a large quantity of dead bees and comb were suitably exposed. Still another observation made by Biró in Singapore is quoted by Kertész in connection with the original description of *Desmometopa singaporensis*.[2] According to Biró's note, this species "lives in the same manner as the European species and appears at once when a spider or *Harpactor* kills a bee."

More recently Dr. Carl Lundström, in Sweden, confirmed a part of Biró's statements by independent observation. "On June 17 of last summer (1905) I observed a swarm of from 20 to 40 small black flies flying about on the flower-heads of a bush of *Cornus alba* in the garden of Julla in Kunstö. By close observation I saw that it was not the flowers that attracted the flies, but a recently killed bee which a spider was clasping around the head and sucking. Unceasingly some of the small flies alighted upon the abdomen of the bee, stayed there for a moment, and then flew up to rejoin the swarm and make room for others of the flies; but during the whole time the swarm itself remained in the same position, flying around the bee."

Lundström caught some of the flies, and of six specimens pre-

[1] Biró, Ludwig. Asztalközösség a legyeknél. Commensalismus bei Fliegen. Termesz. Füzetek, vol. 22, p. 196–199, 200–204. 1899.

[2] Kertész, Koloman. Verzeichniss einiger von L. Biró in Neu-Guinea und am Malayischen Archipel gesammelten Dipteren. Termesz. Füzetek, vol. 22, p. 173–195 (Biró quoted, p. 195). 1899.

served, four belonged to *Desmometopa m-atrum* Meig., and two to *D. m-nigrum* Zett. The spider was a full-grown female of *Misumena vatia* Cl. At that time Lundström was not acquainted with Biró's observations and had only read the article by Mik. He therefore sought to determine more closely the possible relation of *Desmometopa* to the bees. By catching bee after bee, he satisfied himself that the flies do not travel with them. Freshly killed bees pinned to the flower-heads of *Cornus alba* failed to attract them, and bits of white paper with honey spread on them also gave a negative result. Lundström concluded that *Desmometopa* associates with predaceous insects and "immediately after eclosion from the pupa seeks a spider or predaceous insect, to remain associated with it thenceforth and feeding only upon the remains of its prey." In his opinion it is only in this manner that the seeming rarity of these flies, abundant enough under proper conditions, can be accounted for.[1]

Finally, C. A. Frost, in a short note, has indicated that in America *Desmometopa* has similar habits, the species observed by him (*D. latipes* Meig.) being indeed found in both hemispheres.[2] All these observations indicate that commensalism in *Desmometopa* is a well fixed habit, furthermore showing some additional specialization in certain species.

Under the head of "Notes and Exhibition of Specimens," the following were presented:

MIGRATING ARMIES OF MYRIOPODS.

By H. S. Barber, *Bureau of Entomology.*

Just before dusk one day near the end of May, 1903, a surprising migration of myriopods was observed by the writer, the army issuing from the Redwood forest on one side of a logging railroad at Fieldbrook (Buckman), Humboldt Co., Cal., crossing the track on both sides of a little hollow spanned by a short trestle and entering the woods on the other side of the cleared right-of-way. The width of the marching army was perhaps 120 feet, and the width of the cleared right-of-way was about 200 feet. One could not walk in this area without crushing many at each step and it was difficult to count the rapidly moving

[1] Lundström, Carl. Om Desmometopa-arternas snyltgästning hos spindar och rofinsekter. Meddel. Soc. pro Fauna et Flora fennica, Heft. 32, p. 100–104. 1906.

[2] Frost, C. A. Peculiar habits of small Diptera, *Desmometopa latipes* Meig. Psyche, vol. 20, p. 37. 1913.

myriopods in such a small area as a square foot. Several attempts at such a count gave the impression that there were from fifty to one hundred individuals per square foot. All were travelling in the same general direction—westward—but their ranks were denser in places and towards the edges of the army there seemed to be more or less distinct columns. Specimens taken for the National Collection were of a pale color, less than an inch in length and looked like half grown individuals of our eastern *Fontaria*, but have never been determined.

About two weeks after the observation just described the writer saw quantities of what he supposed to be the same species lying dead at the foot of an exposed vertical bank near where the Hoopa Trail crosses Redwood Creek at Bair's Ranch, perhaps 25 miles east of Fieldbrook and not in the Redwood Belt. He believes this mortality could be explained by supposing that part of an army similar to that just described was crossing the face of this bank when the early morning sunlight overcame them and killed those which rolled to the bottom where there was no shelter from the sun. In the same way he had seen other unpigmented inhabitants of the peaty soil of the dark forests such as small myriopods, springtails, and even pale, blind beetles stimulated to violent activity ending in a few moments in death, while he was sifting in the bright sunshine.

Mr. Banks has kindly referred the writer to the paper by Bollman 1888 (Ent. Amer. vol. 4, p. 3) where *Fontaria virginiensis* Drury is reported to have been found crawling on the surface of the ground in large numbers at Donaldson, Ark., July 11, 1887, there being perhaps one adult among five or eight hundred young. The only other accounts of such mass migrations of myriopods known to the writer are contained in letters from Mr. Fred E. Brooks, dated July 13 and August 6, 1908, transmitting specimens of *Fontaria brunnea* from Weston, West Virginia, to the Bureau of Entomology, and stating that they evidently emigrated from the woods, and, moving in armies, invaded dwelling houses and outbuildings, fell into springs and wells and in some cases died in such numbers as to emit a strong stench. In one case the walls of a cellar where they congregated were washed down with hot water several times during their four days' visit at that place and each time two or three gallons of myriopods were taken out. Perhaps a dozen such armies in that section of West Virginia had at that time been reported to Mr. Brooks, who has just replied to a recent inquiry, as follows: "Since writing the letters referred to by you, I have observed migrating armies of the myriopods several times but never in so great numbers as were observed at Weston in 1908. Almost every year I hear of such armies

somewhere in central West Virginia and I think the phenomenon is an annual occurrence here. A friend of mine at Gaston, W. Va., has informed me that a few years ago an army of the myripods invaded and took up their quarters in his strawberry field. They were present at the time the fruit was ripening and were so numerous that it was practically impossible for him to gather his crop of fruit. The creatures collected around and fed on the overripe fruit. I heard of another instance where an army covered an old boardwalk and fed on the damp and decaying surface of the boards until the discolored portion was all scraped away so that the boards looked like they had been newly made."[1]

FRAGMENTARY NOTES ON THE LIFE-HISTORY OF THE MYRIOPOD, SPIROBOLUS MARGINATUS.

By H. S. Barber, *Bureau of Entomology.*

The large common julid, *Spirobolus marginatus*, as determined by Dr. O. F. Cook, is the principal prey of the giant glow-worm *Phengodes laticollis* Lec., in the vicinity of Washington, D. C., and in breeding experiments with this beetle several thousand individuals of the myriopod have been used as food. In securing this food supply for the beetle larvæ some observations have been made which it may be well to put in available form. Mr. Coville has cited this species (Journ. Wash. Acad. Sci. vol. 3, pp. 81–82 and Ann. Rep. Smithsonian, 1913, p. 337.) as one of the important factors in the reduction of the leaf litter into humus, and has alluded to its abundance in restricted localities along the banks of the Potomac River near Plummer's Island where these observations have been made.

Throughout the warmer part of the summer the species is to be found above ground in the dark woods during daytime, but its chief habit is to hide beneath the leaves or under bark of dead logs, except during the night when it is crawling about, eating the lichens from the rocks and the weathered surfaces from the logs or the bark of the trees. Most of its food consists of decaying leaves or rotting wood. Specimens of all sizes from less than one inch to about three inches in length can be found under these conditions from early May until late fall, but there are fluctuations in the numbers in which they appear, which the writer does not understand.

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[1] More recently (July 3, 1915) H. A. Gossard has reported a similar abundance at McArthur, Ohio, where a species (possibly *F. coriacea* Koch,—Banks' determination) was extremely numerous, covering the ground in places and causing much annoyance by getting into wells and springs, but otherwise apparently not doing much damage.

Mating takes place at night on the tree trunks. To endeavor to find where the eggs are laid, about twenty large specimens of both sexes were taken in early May and confined in a deep jar filled with ordinary leaf litter and set in the ground. By the end of July young had appeared in the jar although it had previously been examined without finding eggs. At this time, however, it was discovered that in most cases the excrement pellets were not solid but consisted merely of a thin shell surrounding a comparatively large cavity in which the small brown-skinned egg was lying loose. These pellets showed no external differences from the solid normal pellets cast by large individuals of the species, but when exposed to the air for a few minutes the color changed slightly on account of the more rapid drying out of the thin shell. About a pint of both kinds of pellets was placed in tin boxes where they could be frequently examined. By the middle of August most of the young myriopods had devoured their enclosing pellets and were feeding on the solid ones. They measured 8 mm. in length and had seven pairs of legs, but some were moulting into a slightly longer, many-legged (35 pairs) form. Before the middle of September they had reduced all of the frass pellets in the tin into a mass of very fine frass and were crawling on its surface seeking other food. They congregated on bits of rotten wood that were introduced and began feeding, but the condition of this rotten wood was apparently unsuitable, and a few days later all were found dead on the surface, many having had all their legs eaten off by those who survived the longest.

The writer has been unable to find intermediate sizes between these small (10 mm.) larvæ and those of about an inch in length which are found living free, but he has sometimes found rotten logs in a peculiar state of moist, brittle, almost black decomposition in which great numbers of young *Spirobolus*, one to one and a half inches in length, were living, each in its cell and usually with the remains of one or more cast skins in the same cell. These cells apparently had no external opening and the myriopod was developing by eating away the inner surface of the cell. One such log seen by the writer several years ago had been recently deposited by a freshet on a sand-bar in the river and hundreds of full-grown myriopods were leaving the log and crawling over the sand in all directions away from it. The writer believes that young myriopods enter such rotten wood after freeing themselves from the egg pellets.

The very slow rate of growth of the young larvæ and the fact that at anytime at least four distinct sizes of immature myri-

Mr. H. F. Loomis has pointed out numerous mistakes in this account but is not yet ready to offer his version of the life-history of this species. From his observations he kindly permits me to correct my statement on oviposition as follows:

The [illegible] is not an excrement pellet but is made of regurgitated food, shaped by the legs, pressed into a shallow dish by the front, the edges buttressed by the legs from the ventral side, receives the egg from the genital opening and the edges of the cup are closed in with the front of the head after which the surface is smoothed off by the legs.

HSB. Mar. '17.

opods may be found indicate that the development of the individuals to maturity is a very slow process and it is now expected that such development from egg to egg-laying adult will require four or more years.

As Mr. Coville has indicated, the rôle played by the species is that of a reducer of the waste material in the forest. From the peculiar symbiotic relationship upon which the digestion of such myriopods is said to be dependent it would appear that anything upsetting the balance of this interdependence would react against the myriopod. Under the original continuously forested condition of the eastern United States the distribution of these myriopods was probably much more general but now they are found in comparatively circumscribed colonies so that the chief enemy of the species may be the indirect influences affecting the forest conditions. The older myriopods are well protected against general predators by a strong acid secretion of the lateral pores, but there are two enemies to whom this secretion seems to act as an appetizer. The larvæ of *Phengodes* appear to feed only upon this and allied myriopods and in the combat that follows the attack of one of these beetle larvæ both the larva and the victim become entirely covered with the offensive yellow secretion which appears to cause certain death to almost any other insect larvæ that may be confined in the jar with them. Mr. Banks and others[1] have described the attacks of a small parasitic phorid fly (*Aphiochata xanthippe* Banks, 1911 = *juli* Brues, 1908) which appears generally to breed in other small julids and whose presence causes very great annoyance to all sizes of *Spirobolus*, yet no observation has been made to prove that the fly is actually able to breed in *Spirobolus*. On two or three occasions large sarcophagid (?) larvæ have been found in dead *Spirobolus* in the woods, but no proof of parasitism came to the writer's notice until Mr. W. S. Fisher told him of the attack of a large fly on an apparently healthy myriopod which frantically tried to escape, but on which he found several freshly deposited larvæ. He failed to catch the fly but saved the *Spirobolus* for breeding. It lived five days and from it he preserved a larva and a pupa of the parasite but unfortunately reared only

[1] Knab's short note on this species (Ins. Ins. Mens., vol. 1, 1913, p. 24) cites the following references to its habits:
1884 Lintner, Can. Ent., vol. 16, p. 80.
1884 Dimmock, Can. Ent., vol. 16, p. 80.
1908 Brues, Journ. N. Y. Ent. Soc., vol. 16, p. 201.
1911 Banks, Proc. Ent. Soc. Wash., vol. 13, p. 212.
1912 Malloch, Proc. U. S. Nat. Mus., vol. 43, p. 459.

a single female fly and the male is said to be necessary for determination in the genus *Sarcophaga*.[1]

No satisfactory account of the life cycle of any myriopod has been seen by the writer. Much space is given to the embryology of a few species, but the food of the young, the time occupied by the various stages and the habits of the species are omitted. Sinclair (Cambridge Nat. Hist. 1895, vol. 5, pp. 37–38) describes the preparation of the nest in which *Julus terrestris* deposits and seals up its 60 to 100 eggs, and Morse (Ohio Nat. vol. 4, 1904, pp. 161–163) tells of a somewhat similar habit observed in *Fontaria indiana* but seems to believe that the eggs are laid through the generative opening on the second body segment which the present writer believes improbable.

Two Hundred and Eighty-Fifth Meeting, April 1, 1915.

The 285th regular meeting of the Society was entertained by the bachelor members at the Sængerbund Hall, April 1, 1915. There were present Messrs. Abbott, Banks, Barber, Böving, Busck, Cory, Craighead, Crawford, Cushman, DeGryse, Ely, Fisher, Gahan, Greene, Heinrich, Hood, Hutchinson, Isely, McGregor, Rohwer, Sasscer, Schwarz, Shannon, Snyder, and Walton, members and Mr. A. C. Johnson, visitor.

In the absence of the President the First Vice-President presided.

The following resolution of the Executive Committee was read and on motion of Mr. Barber adopted: "That the Society shall set aside all money received after January 1st, 1915, other than that received as initiation fees, dues or subscriptions, as a separate fund which shall be known as the publication fund. This fund may also be increased by private subscription or may be increased by the balance on hand at the end of any fiscal year provided that the Executive Committee empower the treasurer to transfer such balance to the publication fund.

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[1] Mr. Fisher's data are as follows: Parasitized millipede collected at Inglenook, Pa., June 14, 1912, died from injury of parasitic larvæ June 19. On June 27 five larvæ emerged from the dead millipede, one larva preserved in alcohol. On June 28, the four larvæ pupated, the one pupa preserved. July 11, one adult emerged.

"This fund shall be invested under the direction of the Executive Committee and the income only may be used for publication."

The following papers were presented:

A REVIEW OF HENRIKSEN'S CERAMBYCID LARVÆ IN DANMARK'S FAUNA, BILLER III, TRAEBUKKE, 1914.

By F. C. Craighead,

Branch of Forest Insects, Bureau of Entomology.

In one of the series of papers devoted to the fauna of Denmark, A. C. Jenson-Haarup has discussed the longhorn beetles and K. Henriksen their larvæ.

Henriksen has given a brief and concise discussion of the anatomical and biological characteristics of these larvæ. Following this is a table to subfamilies, genera and species. These are constructed with the idea of quickly identifying the species rather than to illustrate any taxonomic relationships. The most conspicuous characters are used. This has been the first attempt to formulate dichotomous keys for the whole family, which has been avoided by former writers on these larvæ. The arrangement of subfamilies essentially follows the excellent work of Schiödte. Original figures illustrate the chief anatomical characters and for nearly every species the dorsal ampullæ is figured. In the reviewer's opinion too much stress is laid upon the value of these ampullæ. The arrangement of the impressed lines is often intensified or obliterated according to the manner in which the larvæ have been preserved. The structure of the mandibles and ventral mouth parts is very reliable, and can be used as well for cast skins.

Fifty-one species are treated. A brief description of each and the food habits are given. A typographical error occurs under *Pachyta collaris*. It is described with two ocelli instead of five, as given in the table.

A word of comment is necessary on this series of papers describing the Danish fauna. They are more or less popular, prepared for the general public but technical enough to accurately identify the species. A large number of volumes prepared by well known experts on each subject have been published, covering birds, mammals, fishes, reptiles, insects, etc. It favorably reflects on a public that can appreciate and demand such publications.

AN INTERESTING CASE OE ANTENNAL ANTIGENY IN THYSANOPTERA.

By J. Douglas Hood, *United States Biological Survey.*

Sexual differences of both color and structure are very common in Thysanoptera. Usually these differences are minor, but they can no doubt be detected in every species. Occasionally the antigeny produces a dissemblance in habitus which in a few instances has led to the assignment of the sexes to different species or even genera. The dimorphism may appear in any part of the body. It concerns the form of the head in *Trichothrips flavicauda;* the size, form and armature of the three distal segments of the fore legs in nearly all species of Tubulifera; the size and structure of the prothorax, particularly in the Phlœothripidæ; the armature of the pterothorax in the genus *Dinothrips* and of the abdomen in *Kakothrips* and the Megathripidæ;—as well as affecting in numerous ways several other parts of the body of various species. Thus, ocelli and wings are wanting in the males of *Chirothrips* and *Limothrips;* and in the males of most Thripoidea the abdominal sternites have pale sensory areas of constant form and arrangement. Frequently, too, the color of the male is radically different from that of the female.

The antennæ, however, are usually very stable, differing but little with sex, among individuals, or even in different species of the same genus. Many genera are separated on the strength of such characters; and recently a new family has been erected for two European species whose antennæ depart distinctly from the general plan of the group to which they belong.

The occurence in the United States of a species whose female has antennæ of normal form and structure but whose male has these organs so modified through the reduction in size of certain segments, the increase in size of others, and the multiplication of sensory hairs of their surface, must thus be of importance in its effect upon our conceptions of generic characters. While such sexual anomalies should perhaps not in themselves be made the basis for the separation of new genera, they nevertheless point to a probable difference in phylogeny and lead to a search for correspondingly important characters in the opposite sex. In the case of this species such characters are found in the form of the head, the position of the anterior ocellus, the proportionate lengths of the antennal segments, the narrowed prothorax, and the vestigial condition of the ovipositor. It is thus proposed to remove *Thrips perplexus* (Beach) from the genus *Thrips* and to erect for it the new genus described below.

Plesiothrips gen. nov.

(πλησίος, near; θρίψ, a wood worm.)

Body depressed. Head scarcely wider than long, usually broadest across eyes and constricted behind them, triangularly produced in front, sides about parallel between eyes and base of antennæ, the anterior ocellus completely anterior to front margin of eyes. Eyes prominent, protruding, much narrower than their interval. Antennæ seven-segmented, the fourth longer than the third, the seventh slender, males with distinct accessory "ring-joint" at base of segments 4 and 5; antennæ of female nearly normal in structure, those of male with third and seventh segments small and the fourth to sixth elongate and bearing many long hairs which have no analogue in the female; sense cones on segments 3 and 4 forked in both sexes. Maxillary palpi three-segmented. Prothorax of female about as long as head and but very little wider, that of male distinctly shorter; two pairs of long bristles at posterior angles. Wings long and slender, the spines on anterior margin of fore pair long and slender, barely distinguishable from the fringe. Abdomen of the female conical at tip, spines in both sexes long and slender; ovipositor vestigial; ninth abdominal tergite of male with a pair of long, heavily chitinized, finger-like processes arising from strong tubercles on posterior margin, in addition to four pairs of long bristles, of which an approximate median pair are shorter.

Type: Sericothrips ? perplexa Beach.

In addition to the characters furnished by the antennæ and tip of the abdomen in the male, *Plesiothrips* may be separated in the female sex from *Thrips* and *Bagnallia* by the produced head, the position of the anterior ocellus, the elongate fourth antennal segment, the narrow prothorax, and the almost complete absence of an ovipositor. The appearance of "ring-joints" through an actual breaking up of antennal segments is significant, indeed, pointing to the possibility of evolution in the order through an increase in the number of segments. Reduction by fusion is of common occurrence.

Plesiothrips perplexus (Beach).

(Plate XV, Figs. 1–4.)

1896. *Sericothrips ? perplexa* Beach, Proc. Iowa Acad. Sci., Vol. III, p. 216. (Ames, Iowa; on *Cyperus*, corn, and grass.)

1902. *Thrips perplexus*, Hinds, Proc. U. S. Nat. Mus., Vol. XXVI, p. 184, Pl. VI, figs. 66–68, Pl. XI, fig. 123. (Amherst, Mass.; on grasses.)

1913. *Thrips perplexus*, Morgan, Proc. U. S. Nat. Mus., Vol. 46, p. 41. (Florida and Tennessee; grasses, sod and cedar.)

Female (macropterous). Both Miss Beach and Dr. Hinds (loc. cit.) have written good descriptions of this sex, and Hinds gives four figures. Detailed measurements are given below, and on Plate XV, figures 3 and 4 illustrate the head and prothorax and the antennæ.

Measurements: Length 1.06 mm.; head, length 0.123 mm., width 0.135 mm.; prothorax, length 0.126 mm., width 0.153 mm.; pterothorax, width 0.204 mm.; abdomen, width 0.198 mm.; wings of fore pair, length 0.660 mm., width at base 0.057 mm., at middle 0.041 mm.

Antennal segments:		1	2	3	4	5	6	7
length	(μ)	24	33	40	50	36	60	28
width	(μ)	32	24	22	22	17	18	8

total length of antenna, 0.271 mm.

Male (macropterous). Length about 0.9 mm. Color blackish brown, with tarsi, apices of tibiæ, pedicel of third antennal segment, and five or six basal abdominal segments yellowish; thorax with orange-red hypodermal pigment; fore wings brownish gray, nearly clear in basal third, beyond which and at tip they are slightly darker.

Head more slender than in female and slightly longer than wide. Antennæ (Plate XV, fig. 1) with third and seventh segments small, and the fourth and sixth elongate and bearing many long hairs; pedicels of segments 4 and 5 distinctly separated from segments themselves and freely movable.

Prothorax 0.8 as long as head and about 1.4 times as wide as long.

Abdominal sternites 3 and 4 with a pair of small, circular, pale areas at lateral third; tergite 9 (Plate XV, fig. 2) with a pair of long, heavily chitinized, finger-like processes arising from strong tubercles on posterior margin, in addition to four pairs of long bristles of which an approximate median pair are shorter.

Measurements: Length 0.88 mm.; head, length 0.120 mm., width 0.115 mm.; prothorax, length 0.096 mm., width 0.138 mm.; pterothorax, width 0.180 mm.; abdomen, width 0.120 mm.

Antennal segments:		1	2	3	(4)	4	(5)	5	6	7
length	(μ)	24	30	30	3	59	3	44	84	15
width	(μ)	30	24	21	8	20	8	18	18	3

total length of antenna, 0.292 mm.

Distribution:

Iowa.—Ames, August and November (Beach).

Massachusetts.—Amherst (Hinds).

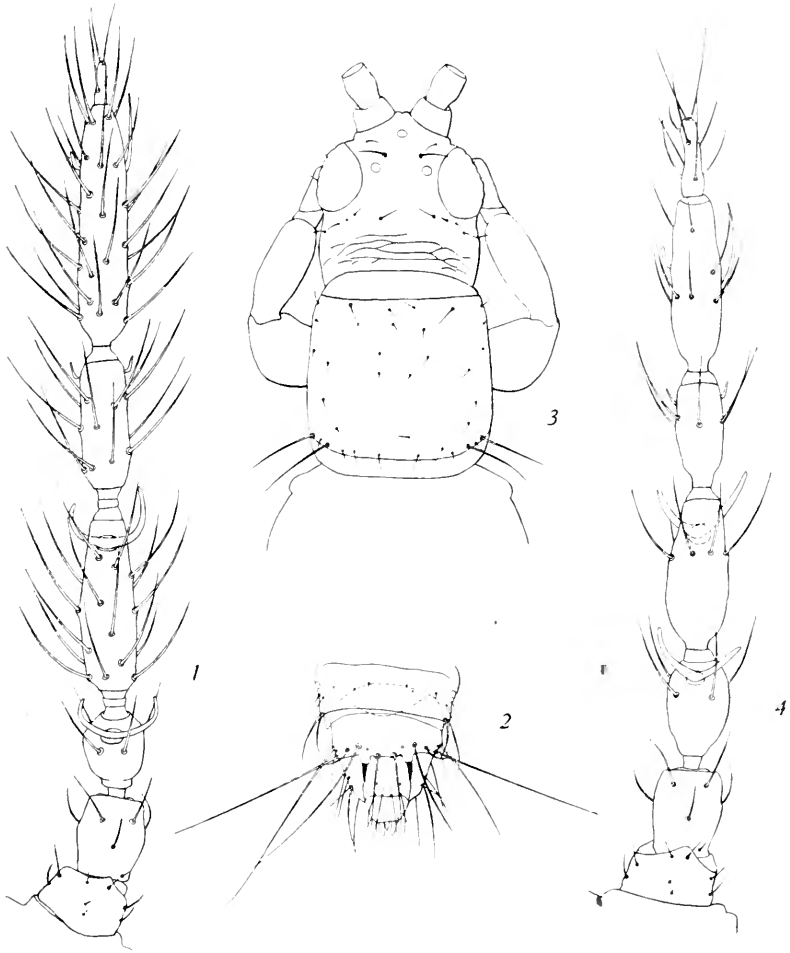
Florida.—Quincy, September 8, 1909 (Morgan); Orlando, November 4, 1914, C. B. Williams, 2 ♂'s.

Tennessee.—Clarksville, April 2, August 19, and October 15, 1910 (Morgan).

Maryland.—Plummer's Island, July 27 and September 14, 1913, J. D. H., 2 ♀'s.

District of Columbia.—Washington, November 3, 1914, J. D. H., 2 ♀'s.

Illinois.—Anna, Bondville, Carbondale, Clay City, Havana, Hillery, Makanda, Muncie, Odin, Pulaski, and Urbana, throughout the year, 14 ♀'s and 10 ♂'s.



PLESIOTHRIPS PERPLEXUS (BEACH).

Fig. 1. Male, left antenna.
Fig. 2. Male, segments 8–10 of abdomen.
Fig. 3. Female, head and prothorax
Fig. 4. Female, left antenna.

Texas.—Brownsville, December 8, 1910, C. A. Hart, 1 ♂.

In my experience, this species is restricted entirely to grasses, where the adults occur throughout the year at the base of the leaves, in the region of the axils. Morgan records it also from cedar, but this record is probably based on a single female which had paused in flight. The life habits are thus quite different from those of the species of allied genera, all of which live in more or less exposed situations in the flowers or on the leaves of plants. The ovipositor may have degenerated from disuse, the necessity for the insertion of the eggs in plant tissue to secure protection having disappeared with the changed habitat of the insect. In this respect, as Dr. Hinds remarks, the species shows a divergence toward the Tubulifera, which lay their eggs wholly externally. It should be added that so great is the reduction of the ovipositor that Miss Beach in describing the species was led to believe her specimens all males, whereas they were really all females. She directed attention in her discussion of the insect to the depressed head, the produced front, the position of the ocelli, and the elongate fourth antennal segment.

DESCRIPTIONS OF NEW ICHNEUMONIDÆ AND TAXONOMIC NOTES.

By R. A. Cushman, *Bureau of Entomology.*

The present paper consists largely of descriptions of new species of economic importance, together with some notes on previously described species and genera and the designation of a new genus.

Calliephialtes thurberiæ n. sp.

In color and markings this species is very like *Pimpla notanda* Cress., which should also be referred to *Calliephialtes*, but in structure and in the white lower surface of the scape and pedicel in the male it is more closely allied to *graphalithæ* Cress.

Female. Length 9 mm.; ovipositor 8 mm. Face as wide as long and with a short median carina below the antennæ; distance from side of clypeus to eye much shorter than malar space; eyes slightly emarginate within; postocellar line sub-equal to the ocell-ocular line; occiput but weakly excavated; head throughout polished and impunctate; pro- and mesothorax polished and practically impunctate; notauli distinct anteriorly, the prescutum, viewed from above, subtruncate; foveolate furrow of mesopleura obsolete above position of punctiform fovea, the latter scarcely impressed; carina between metapleura and propodeum not obsolete in front of spiracle; propodeum polished, with scattered punctures laterally; nervellus broken at about the middle and at a distinct angle; first tergite

about as wide apically as long, much shorter than second, anterior excavation polished, carinæ obsolescent, sparsely punctate apically and more strongly so laterally; tergites 2–5 similarly punctured, the elevations on 3–5 nearly impunctate.

Black with mesonotum laterally, scutellum entirely, and postscutellum apically, rufous; spot below the tegula, mesosternum and pleuræ below, hind coxæ and all femora ferruginous; mandibles pale at base; pedicel beneath and scape narrowly at apex, palpi, front and middle coxæ, trochanters, except basal joint of hind pair, tegulæ and line on pronotum, whitish; hind tibiæ with a yellowish longitudinal stripe below which entirely embraces the tip, upper side whitish with small infuscated spot near base; remaining portions of legs pale straminous with the hind tarsal joints darker apically; wings hyaline, veins and stigma fuscous white at base.

Male. Length 8.5 mm., antennæ 5.5 mm. Differs from female as follows: face relatively somewhat longer; ocell-ocular line somewhat shorter than postocellar line; first tergite about one-third longer than wide, polished medially.

The ferruginous color is paler throughout and embraces the entire mesonotum and metapleuræ in addition to the areas enumerated in the description of the female; legs paler, front and middle pairs largely white.

Host: Anthonomous grandis thurberiæ Pierce.
Type locality: Santa Rita Mts., Ariz.
Type: Cat. No. 19157, U. S. N. M.

Described from two females and a male reared from larvæ of the host in bolls of *Thurberia thespesioides*, the females from material collected by Mr. E. A. Schwarz, April 12, 1913, in Stone Cabin Canyon and the male from material collected by Mr. Schwarz March 12, 1913 at McCleary's Ranch, both localities in the Santa Rita Mts. The paratype female is almost identical with the type.

(**Pimpla**) **Calliephialtes grapholithæ** (Cress.)

Synonym.—*Calliephialtes xanthothorax* Ashm.

Genus Homaspis Foerster.

The only character used by Foerster to separate this genus from *Notopygus* Holmgren is the lack of an areolet in the front wing. The genotype, *H. rufinus* (Grav.), has the areolet, while Davis's two species and the one described below lack it. Better characters for separating the two genera are found in the apically impressed clypeus in *Homaspis* and its slender legs, the hind tibiæ being much longer than their femora, while in *Notopygus* the hind tibiæ are very stout and hardly longer than their femora.

Homaspis nigripes, n. sp.

Distinct from either of the two species described by Davis in its larger size and its largely black legs.

Female. Length 16 mm. Head transverse, the temples rather broad and strongly rounded; clypeus hardly more than a fourth as long as wide, sparsely punctured and obscurely transversely rugulose; eyes nearly touching the mandibles, parallel within and broadly, weakly emarginate; face nearly twice as wide as long, gibbous immediately below the antennæ, flat below, rather coarsely, densely punctured; front impressed on each side above the antennæ, sculptured like the face but smooth in the impressions; vertex and temples weakly punctured; ocell-ocular and postocellar lines equal and somewhat greater than diameter of lateral ocellus; thorax weakly, densely punctured, notauli rather weak; propodeum with eight areas, five basal and three apical, areola and petiolar area separated, areola polished, the other basal areas weakly punctured and apical areas more or less transversely rugulose; spiracle oval; abdomen slender, its sides very gradually divergent nearly to apex, weakly punctured; first tergite four times as long as apical width, parallel sided before the spiracles, which are placed somewhat beyond the middle, half as wide at spiracles as at apex, dorsal carinæ weak, fading out shortly beyond the spiracles, but with a weak median impression extending somewhat further; second tergite about two-thirds as long as first with weak median impression; third and fourth subequal to second, fifth only about a third as long as the others, mostly hidden above; wings without areolet; nervellus broken slightly above middle; hind tibiæ somewhat longer than their tarsi and about a third longer than their femora.

Black with abdomen, except basal three-fourths of first tergite, rufous; clypeus, mandibles, except apices, inner orbits below, irregular spot in middle of face, scape beneath, spot above eye, and scutellum above, yellow; wing bases, tegulæ, spots in front and below tegulæ, front coxæ outside, two small spots on middle coxæ, front and middle tibiæ and tarsi and apices of their femora, and articulation between hind femora and tibiæ white; legs otherwise black, the front and middle ones somewhat piceous; wings yellowish-hyaline.

Type locality: Estes Park, Colo.

Type: Cat. No. 19304, U. S. N. M.

A single specimen taken by F. H. Snow August 1892 and bearing the label U. of K. Col. Lot. 153.

Notopygus scutellatus n. sp.

In my table[1] to the North American species of this genus this species runs closest to *virginiensis* Cush., from which it is at once distinguishable by its pale scutellum, postscutellum, and front and middle coxæ and its apically black hind tibiæ and tarsal joints.

[1] Proc. U. S. N. M., vol. 48, 1915, p. 511.

Female. Length 15 mm.; antennæ 12 mm. Differs from *virginiensis* Cush. as follows: antennæ black with an obscure indication of a pale annulus about two-thirds of the way to tip; tapering apically, flagellum 45-jointed (in type of *virginiensis* tips of antennæ are broken off); propodeum with middle area transversely rugose at top of posterior declivity, spiracle rather large oval (in *virginiensis* the spiracle is small and round); scutellum and postscutellum, tegulæ and spots in front and below, yellow; hind coxæ black, front and middle coxæ yellow, testaceous at base; all trochanters yellow, those of hind legs somewhat darker; front and middle femora testaceous, yellow at base and apex; hind femora black, yellow at base and apex; front and middle tibiæ and tarsi pale testaceous, the tibiæ yellow at base; hind tibiæ yellow at base, black at tip, their tarsi yellowish, the joints apically infuscate; abdomen piceous-black with apical segments and ovipositor yellowish; first tergite apically, second entirely, except an obscure dark spot on each side of middle, and basal half of third testaceous; first tergite similarly though less coarsely sculptured, its sides arcuately divergent beyond the spiracles (in *virginiensis* the sides beyond the spiracle are at first concave then arcuate); second tergite with carinæ weak, more finely punctured; remaining tergites polished, minutely punctured.

Type locality: Cornwall, Idaho.
Type: Cat. No. 19299, U. S. N. M.
A single specimen taken by C. V. Piper on August 1, 1898.

(**Monoblastus**) **Trematopygus caliroæ** (Viereck).

The types of *Monoblastus caliroæ* Vier., described from specimens reared by the present writer from *Caliroa cerasi*, run in Davis's table to this genus, and agree very well with his description of *fusculosus* Davis. Davis's description is based on the male sex only. Before me are the two females and the male of the type series of *caliroæ* Vier. together with a male and a female taken by me on cherry trees badly infested with pear slug at North East, Pa. The males have all of the characters mentioned in the description of *fusculosus* and in addition have the apical tergites somewhat infuscated. The females differ from the males in having the wings somewhat paler, the first tergite red except the extreme base and the carinæ, the apical tergites red, and the pale color of the coxæ, mandibles, trochanters and tegulæ more reddish.

Trematopygus eriocampoididis n. sp.

In Davis's table to the genus this species will run to *fusculosus* Davis, but differs from that species and *caliroæ* (Vier.) in having the abdomen entirely black.

Female: Length 5 mm.; antennæ 6 mm. Face polished, sparsely, minutely punctured, and with a very small, rounded tubercle medially below

the antennæ; clypeus coarsely, rugulosely punctured; inner margins of eyes sinuate opposite the antennal fossæ; front and vertex polished and very minutely punctate; mesonotum polished, minutely punctate, impressed medially; notauli strongly impressed anteriorly, prescutum truncate and prominent; pronotum laterally polished, minutely punctate and somewhat rugulose; mesopleura polished, punctate below and anteriorly, a short, broad impression in the position of the sternauli, prepectal carina distinct and approximating the anterior edge of the pleura about half way up; metapleura sparsely punctured anteriorly, scabrous posteriorly; propodeal carinæ strong, basal median and lateral areas polished, all other areas, especially the apical ones, more or less roughly sculptured; first tergite about as wide apically as long, dorsal carinæ sharp and extending two-thirds of way to apex, polished between carinæ, otherwise punctate, especially laterally toward the apex; second tergite basally fine, rugulosely punctate, apically together with the remaining tergites minutely punctate, polished; ovipositor nearly perpendicular, barely extending above the dorsum; subdiscoidal vein of hind wing nearly interstitial with lower end of nervellus.

Black, with coxæ black, the front and middle ones pale at apex; mandibles at base and tegulæ pale; clypeus piceous at sides; abdomen more or less reddish on the sides apically; legs red with trochanters, front and middle femora apically, front and middle tibiæ and tarsi and hind tibiæ, except apices, paler; hind tibiæ at apex and hind tarsi fuscous; wings dusky, veins and stigma fuscous.

Male. Very like the female with a somewhat greater tendency to red on coxæ and abdomen, and with the antennæ paler beneath at base.

Host: Caliroa (Eriocampoides) cerasi L.
Type locality: North East, Pa.
Type: Cat. No. 19154, U. S. N. M.

Described from six females and four males (Quaintance No. 10934) taken by the writer August 26 and Sept. 5, 1914 on cherry trees badly infested by the pear slug, paratype *a* in the act of ovipositing in a nearly full-grown slug.

This species shows some variation in the color of the abdomen and coxæ and in the sculpture of the propodeal areas, pleuræ, and tergites, the color varying toward reddish-piceous and the sculpture showing more or less reduction on the parts mentioned. Paratype *b* exhibits some curious abnormal characters. In this specimen, a female, the prescutum is impressed anteriorly; the propodeum is very short, the basal areas being almost entirely obliterated; and the abdomen and legs are much shorter and stouter than in a normal specimen.

Genus Omorgus Foerster.

The following table includes those species of the genus the types of which are in the National Museum, and shows the affinities of the two new species described below.

Table of Species.

1. Posterior orbits sloping roundly inward behind the eyes 2
   Posterior orbit straight and broad 6
2. Hind tibiæ white at base and in the middle with a black annulus near the base and another at the tip, the two connected below by a reddish stripe; hind basitarsus white at base, front and middle coxæ mostly reddish ..... *phthorimacæ* n. sp.
   Hind tibiæ reddish, sometimes infuscated near base and at apex ... 3
3. All coxæ red; scape beneath not pale; nervellus curved outward and not broken; fovea of second tergite much nearer to base than to spiracle ..... *ferrugincipes* Ashm.
   Some or all of the coxæ black; fovea of second tergite but little nearer to base than to spiracle 4
4. Front and middle coxæ red, hind pair black; abdomen largely red, the first and second tergites tipped with red ..... *polychrosidis* Vier.
   All coxæ black; abdomen normally entirely black but sometimes reddish laterally toward apex, the first and second tergites always black 5
5. First tergite with a punctiform median impression somewhat in front of the spiracles, the segment in side view swelling rather abruptly from this point backward; ovipositor three-fifths as long as abdomen; hind trochanters black; wing veins fuscous; nervellus broken some distance above anal vein ..... *tortricidis* n. sp.
   First tergite without a median dorsal impression and gradually swollen apically; ovipositor half as long as abdomen; hind trochanters red; wing veins rufous; nervellus not broken, the trace of the subdiscoidal vein interstitial ..... *nola* Ashm.
6. Hind and middle femora infuscated; scape not pale beneath; ovipositor three-fifths as long as abdomen; nervellus broken well above anal vein; large species, 8 mm. ..... *epinotiæ* Vier.
   Hind and middle femora red; scape pale beneath; ovipositor half as abdomen; nervellus straight subdiscoidal vein absent; small species, 4 mm. ..... *nigricincta* Ashm.

Omorgus tortricidis n. sp.

Very closely allied to *nola* Ashm., but easily distinguished from that species by the characters given in the table to species.

Female. Length 5.5 mm.; ovipositor 2 mm. Head opaque granular and clothed with white pubescence; clypeus slightly elevated and with a shallow median impression, sparsely punctate; malar two-thirds as long

as basal width of mandibles; eyes very shallowly emarginate within; thorax opaque granular with scattered faint punctures; propodeum with strong carinæ, areas granular, the petiolar area transversely rugulose posteriorly and deeply excavated, areola barely angulate at the costulæ, basal middle area minute quadrate; areolet minute, with the outer cross vein bullated apically; nervellus distinctly broken some distance above anal vein; first tergite with a punctiform impression medially somewhat in front of the spiracles, the segment in side view swelling somewhat abruptly from this point backward.

Black with all coxæ and hind trochanters black, rest of legs, mandibles, and scape beneath rufo-testaceous, the front and middle legs somewhat paler, the hind tibiæ slightly infuscated apically and near the base; tegulæ yellowish; wings hyaline, veins and stigma fuscous.

Male. Length 5 mm. Differs from the female but very slightly.

Host: Polychrosis viteana.
Type locality: North East, Pa.
Type: Cat. No. 19155, U. S. N. M.

Described from a large series of both sexes reared by the author and his associates, Dwight Isely and E. R. Selkregg, from the above host under Quaintance No. 7895, during the season of 1914. This species has been previously recorded from the same host by Johnson and Hammar (Bur. Ent. Bul. 116, Part II, p. 48) as *Omorgus nolæ* Ashm. race.

The species varies more or less in nearly all the characters mentioned above, especially in venational and propodeal characters.

Omorgus ferrugineipes Ashm.

Three females and a male of this species are at hand reared by the writer from larvæ of *Polychrosis viteana* at North East, Pa., during the season of 1914 and under Quaintance No. 7996. These differ only in minute details from the unique type male. In the female the basal middle area of the propodeum is triangular but not petiolate behind as it is in type. The female is 5 mm. long and the ovipositor 1.25 mm.

Omorgus phthorimaeæ n. sp.

This species is very distinct from all the species included by the annulation of the hind tibiæ.

Female. Length 5 mm.; ovipositor 1.25 mm. In size, form, and sculpture very like *tortricidis*, described above, but differing from that species in the following particulars: clypeus not at all elevated and without shallow median impression; basal middle area of propodeum twice as wide at base as at apex and about two and one-half times as long as wide at apex, areola distinctly angulated at the costulæ, its bounding carinæ parallel for a short distance back of the costulæ; first tergite without median impression and in side view more evenly swelling posteriorly; nervellus less distinctly broken sometimes not at all.

Black with the coxæ and basal segment of posterior trochanters black; mandibles, palpi, trochanters, except as noted above, and tegulæ, whitish; posterior tibiæ white with the apex and an annulus near the base black, the two connected beneath by a reddish stripe; hind basitarsus white with apex black; middle tibiæ and tarsi with same arrangement of color as in hind legs but the black replaced by fuscous; all femora and front tibiæ of varying shades of rufous, the hind femora darkest and front tibiæ lightest.

Male. Differs from the female largely in the more contrasting colors of the legs, the lack of annulation on the middle tibiæ, and in having the basal middle area of the propodeum reduced to a triangle connected with the areola by a single short carina.

Host: Phthorimaea operculella.
Type locality: Pasadena, Calif.
Type: Cat. No. 19156, U. S. N. M.

Described from 4 females and 6 males reared from the above host by J. E. Graf in November, 1914, under Chittenden No. 2230[07].

This species varies in the following manner: one of the females has the sides of the abdomen beyond the second tergite largely red; the size and form of the basal middle propodeal ares varies in more or less reduction from the type; and some of the males show a rather distinct color pattern on the middle tibiæ.

Genus Xenoschesis Foerster.

The only species originally included in this genus and therefore the genotype is *Exetastes fulvipes* Grav., so placed by Jemiller (Ber. Ver. Augsberg, vol. 31, 1894, p. 147). The same species was selected by Kriechbaumer as the type of his genus *Glyptocentrus* and by Viereck as the type of *Polycinetis* (Foerster) Dalla Torre and *Polycinetus* Thomson. The genotype of *Polycinetis* Foerster as fixed by Woldstedt is *Notopygus resplendens* Holmgren. This species is shared as a genotype by *Prosmorus* Foerster, by fixation of Thomson, and, through its variety *polita* (Foerster) Kriechb., by *Eriglæa* Foerster, by fixation of Viereck. All of the above was pointed out by Viereck (U. S. N. M., Bul. 83).

Examination of specimens of the genotypes, *fulvipes* as determined by Schmiedeknecht and *resplendens* as determined by Roman, convinces me that they are congeneric. Therefore *Polycinetis* Foerster, *Polycinetus* Thomson, *Glyptocentrus* Kriechbaumer, *Prosmorus* Foerster, and *Eriglæa* Foerster are all synonyms of *Xenoschesis* Foerster.

As to the position of the genus, I prefer to place it with the Banchini, rather than with the Mesoleptini. It should be noted

that in dichotomy 6 in Ashmead's table the first character is useless since the areolet varies in respect to its presence or absence and length of the petiole. In the specimen of the genotype on which my study is based it is strongly petiolate. The possession or lack of a large petiolar area on the propodeum is a specific character. The genotype and *resplendens* lack the carinæ, while of the two American species described below one lacks them and the other has them well defined.

Xenoschesis slossonæ n. sp.

Agrees fairly well with the description of *limatus* (Cress.) but differs in having the propodeum carinate.

Female. Length 11 mm.; antennæ 10 mm.; ovipositor 0.5 mm. Clypeus a third as long as wide, broadly truncate, transversely ruguloso-punctate; face nearly twice as wide as long, densely, rather coarsely punctate, especially medially, slightly elevated above; malar space nearly half as long as basal width of mandibles; eyes sinuate within and parallel; flagellum 40-jointed, apically attenuate; front densely, minutely punctate; temples and vertex polished, impunctate; thorax and propodeum polished, rather densely, finely punctate, the latter short and gibbous above, with the lateral carinæ strong beyond the apical carina but subobsolete before, the apical carina weak, obsolete outside the lateral carinæ, areola punctiform, basal median area weakly defined and minute, petiolar area impunctate, spiracle oval; wings with areolet; nervellus broken slightly above middle; abdomen deeper than wide, subpolished, very minutely shagreened; first tergite about three-fifths as wide at apex as long, with two subcarinate dorsal ridges reaching to about two-thirds of the way to the apex and subending a longitudinal depression, spiracles placed slightly before middle; second tergite about as long as basal width and subequal to third and fourth, others rapidly diminishing in length; hypopygium reaching slightly beyond apex of eighth tergite.

Black, with clypeus, mandibles, tegulæ, wing bases, and apices of sternites 1-3 white; palpi pale; antennæ brown, paler below, scape and pedicel piceous; legs testaceous except as follows: front and middle femora at apex, all tibiæ except apices, front and middle tarsal joints basally white; hind femora and tibiæ at apex and hind tarsi throughout black, the basitarsus slightly paler at base; hind calcariæ dusky white; wings hyaline, stigma piceous, pale at base.

Type locality: Mt. Washington, N. H.
Other locality: Spruce Brook, Newfoundland.
Type: Cat. No. 19302, U. S. N. M.

Two females, the type collected by Mrs. Slosson and the paratype by E. M. Walker on July 24, 1914.

The paratype differs from the type in having the clypeus pale only at apex, antennæ black, flagellum 44-jointed, propodeum

with the carinæ weaker, the areola open behind, legs with the colors of the tibiæ, especially of the middle legs, more contrasting, tergites 1 and 2 relatively wider.

Xenoschensis gracilis n. sp.

Female. Length 11 mm.; antennæ 8.5 mm.; ovipositor barely exserted. Differs from *slossonæ*, described above as follows: clypeus somewhat shorter; face uniformly densely punctate; flagellum 33-jointed; propodeum not gibbous above, without carinæ except lateral carinæ at apex, smooth and impunctate, spiracle round; nervellus broken below the middle; abdomen wider than deep, polished, sparsely, weakly punctate; tergites relatively longer, the first about half as wide as long and without dorsal ridges though with a weak median furrow, spiracles at middle, fifth nearly as long as fourth; hypopygidium not reaching apex of eighth tergite.

Black; clypeus and mandibles whitish; tegulæ and wing bases pale fusco-testaceous; legs rather pale testaceous, hind femora apically and their tibiæ and tarsi throughout blackish; otherwise as in *slossonæ*.

Type locality: Franconia, N. H.
Other locality: Banff, Alberta, Canada.
Type: Cat. No. 19303, U. S. N. M.

Two specimens, the type collected by Mrs. Slosson and the paratype without other label than the number 458.

The paratype differs from the type in no way except that the areolet is somewhat petiolate.

Prosmoridea, new genus.

The sinking of *Prosmorus* (Foerster) Thomson into synonymy with *Xenoschesis* Foerster leaves *Prosmorus* (Foerster) Davis without a name. It is for this that I suggest the above name, designating as the genotype *Prosmorus elongatus* Davis. It differs from *Xenoschesis* in having the propodeum completely areolated, the apical carina tuberculate above on each side, in lacking the emargination of the eighth tergite in the female, and in having the sheaths of the ovipositor very broad. It resembles in habitus much more closely *Cidaphrurus* and *Banchus* and should probably be placed with the Banchini rather than with the Mesoleptini. From the two banchine genera mentioned it differs in the complete areolation of the propodeum, the strong prepectal carina, the small oval propodeal spiracle, the petiolate first tergite with its spiracle at about the middle, the position of the fracture of the nervellus which is at or below the middle, the simple claws in the female, and from *Cidaphrurus* by lacking the scutellar thorn. In Foerster's table it runs to *Banchus*.

Bassus carpocapsæ Cush.

Since the writing of the description of this species, when only the female was known, a single male has been reared by the author from codling moth material collected in 1913 at Vienna, Va. This differs from the female in having the testaceous color of the head confined to the orbits, malar space, clypeus, and mouth, being practically obsolete on the anterior orbits; only the second and third tergites are rufous and the latter is somewhat infuscated at the apex; the hind coxæ are more largely black and the hind femora infuscated. This male is in the National Museum collection and is indicated by a red label marked: ♂ Cush. det.

THE GENUS SECODELLA IN NORTH AMERICA.

By J. C. Crawford.

This eulophid genus which has the hairs of the fore wings in part arranged in characteristic rows is also peculiar in having the under side of the fore wings furnished with a row of long hairs situated on the disc of the wing just back of the central portion of the marginal vein. This latter character I have observed in no other genus.

KEY TO THE FEMALES

1. First joint of funicle not distinctly longer than pedicel..... 2
   First joint of funicle distinctly longer than pedicle..... 3
2. Larger (2 mm.) greenish, sculpture of thorax strong.....*cushmani* n. sp.
   Smaller (1.25 mm.) purplish, sculpture of thorax weak..*acrobasis* n. sp.
3. Last joint of club without an apical spicule.....*rugosus* n. sp.
   Last joint of club with an apical spicule..... 4
4. First joint of funicle longer than second, about twice as long as pedicel. *viridis* n. sp.
   First joint of funicle not longer than second, about one and one-half times as long as the pedicel.....*argyresthiæ* Cwfd.

Secodella cushmani n. sp.

Female. Length about 2 mm. Dark green with bluish reflections; first joint of funicle hardly longer than pedicle, joints of funicle successively decreasing in length, the fourth subquadrate; club about as long as last two joints of funicle united; mesothorax strongly subreticulate, much more finely so on parapsidal areas; propodeum short; abdomen more bluish than head and thorax; wings hyaline with three lines of hairs from stigmal knob, one directed basad and forming boundary of area without hairs, two directed apicad; one line of hairs along posterior margin of wing and one somewhat in front of this and another line reaching apex of wing

but originating on disk of wing; under side of fore wings with a row of about 7 long hairs near marginal vein; legs metallic, tarsi whitish.

Male. Length about 1 mm. Similar to the female except in secondary sexual characters.

Type locality: North East, Pennsylvania.
Host: Polychrosis viteana.
Type: Cat. No. 19653 U. S. M. N.
Described from seven specimens under Bureau of Entomology, Quaintance No. 10905, R. A. Cushman, collector.

Secodella acrobasis n. sp.

Female. Length about 1.25 mm. Violaceous with some bluish reflections; first joint of funicle no longer than pedicel, all joints of the funicle short, hardly longer than broad; club about as long as the last three joints of the funicle combined; mesonotum finely weakly reticulated; wings hyaline with three lines of hairs from stigmal knob as in previous species; basal half of the area between the two rows directed apicad, without bristles; two rows of hairs near posterior margin, one discal row; under side of fore wings with a row of three or four long hairs posteriad of middle of marginal vein.

Male. Length about 0.8 mm. Similar to female excepting secondary sexual characters.

Habitat: Monticello, Florida.
Host: Acrobasis nebulella.
Type: Cat. No. 19654, U. S. N. M.
Described from one female and nine males under Bureau of Entomology Quaintance No. 10540. Reared by J. B. Gill from over-wintering larvæ of the host.

Secodella rugosus n. sp.

Female. Length about 3.25 mm. Dark brown with propodeum and base of abdomen more distinctly greenish; head and thorax, especially the parapsidal areas and scutellum, more purplish; first joint of funicle much longer than the pedicel and much longer than the second joint, the latter about as long as pedicel, third and fourth joints of the funicle successively shorter, the fourth subquadrate; club about as long as the third and fourth joints of the funicle combined, the last joint without any sign of spicule; head and thorax coarsely reticulated, the reticulations on the axillæ, parapsidal areas and scutellum finer; propodeum long, with a median and lateral carinæ and in addition irregularly rugulose; laterad of the spiracles with thimblelike punctures; wings hyaline with the same number of rows of bristles as in the previous species but the discal row basally curved toward the rear of wing and meeting at its base the row next caudad of it; rows of long hairs on under side of wing in rear of marginal vein, numbering ten; legs metallic, apices of the tibiæ testaceous, tarsi whitish.

Type locality: Oswego, N. Y.

Type: Cat. No. 19655 U. S. N. M.

Described from three specimens, one of the paratypes having seven hairs in the row on the under side of wing the other with six.

Secodella viridis n. sp.

Female. Length about 3 mm. Bright green; first joint of funicle about twice as long as pedicel, the following joints successively decreasing in length, the fourth about as long as the pedicel; club about as long as last two joints of funicle combined; head and thorax very finely reticulated; propodeum short, with a median carina; wings hyaline, with the three usual rows of hairs from stigmal knob; a short discal row of hairs joins the posterior of the two apically directed rows from stigmal knob at about its middle; two rows of hairs near posterior margin of wing, three short discal rows; the surface of the wing along each side of all rows of hair is without hairs; row of hairs on underside of wing near marginal vein numbering about four; legs brown, femora with greenish tinge; tarsi whitish.

Male. Length about 2 mm. Similar to the female.

Type: Cat. No. 19656, U. S. N. M.

Described from eight specimens under Bureau of Entomology No. 2610, reared January 19 and 22, February 8, 11, 13, 19 and 24, 1886; the note for these specimens cannot be located at present so type locality and host cannot be given.

Under the heading of "Notes and Exhibition of Specimens," the following were presented:

A NEW SPECIES OF STENARES.

(*Neuroptera, Myrmeleonidæ.*)

By Nathan Banks.

Stenares completus n. sp.

Face pale yellowish, mandibles, palpi, and antennæ black; vertex gray, with a median black line, widening into a triangle behind, and with about ten or twelve small black spots each side; pronotum gray, with a broad black median stripe, the lateral margins black, between them and the median stripe is a black dot each side, some gray hair, but black on lower sides; rest of thorax gray, lined with black, but densely long haired, the hairs rather grayish white, pleura still more densely gray haired. Abdomen short, black, with short white hair, each segment with one or two small, obscure yellowish spots each side above. Legs black. Eyes rather less than diameter apart in front; the last joint of palpi is one and a half times as long as space between eyes; vertex very high; pronotum broad, not much narrowed in front. Fore wings scarcely marked; an apical costal streak

and a fainter one below it, a faint prestigmal mark, not distinct, between median and radial sector; the space between median and cubitus is dark, except for three interruptions; nearly all other veins, especially the cross-veins, have little black spots at intersections and also between intersections. The hind wings are marked very similar to those of *S. irroratus* but the spot near the cubital fork is larger and reaches up to the subcosta; behind the median band there is one large spot on the margin; the stigmal band is narrow on the costal part, and then much broader and reaches obliquely to the hind margin; the apical spots as in *S. irroratus;* between the stigmal and median bands there is near the hind margin, a large oblique mark, its upper point directed toward the median band. In fore wings the costals are all crossed, in the hind wings about six near the base are crossed. Expanse 130 mm.

From Abyssinia, D. Daona. It differs from *S. irroratus* (of which I have seen the type) in the spotted vertex, the less marked fore wing, and more heavily marked hind wing, and presence of large spot between median and stigmal bands.

A NEW SPECIES OF MYCETAULUS

(Diptera, Sepsidæ.)

By Nathan Banks.

Mycetaulus pulchellus n. sp.

Head yellowish or rufous, ocellar area black; thorax above and below wholly yellow or pale reddish yellow; abdomen dark brown or black, shining; legs pale yellowish, unmarked, except that the hind tibiæ are rather infuscated on the basal half. Abdomen with fine, short, dark hair mostly on the base; head and thorax with long black bristles, six across vertex, and two proclinate ocellar bristles; thorax with about fourteen, and four on edge of the scutellum, the median pair very long. Wings hyaline, veins brownish, a black spot over the ends of the second and third longitudinal veins; posterior cross vein about two-thirds its length from the margin, and one and a half its length (or more) from the anterior cross-vein. Halteres white. Abdomen short and broad, convex, acute at tip.

Length of body 3 mm., of wing 3 mm.

From Falls Church, Va., September 28, and Glencarlyn, Va., October 7. But one species has been described from North America, *M. longipennis* Loew from British America; it has basal dark spot on the thorax, and the metanotum and pectus dark, and the costal cell is also darkened. The genus, though resembling *Sepsis* and *Nemopoda* differs in lacking auxilliary vein, or rather the auxilliary is united to the first vein. It differs in appearance from *Piophila*, and in that the fourth vein is not bent up at anterior cross-vein.

MISCELLANEOUS NOTES.

By Nathan Banks.

1. *Andrena carlini* Ckll. Sucking Sap.

Mr. Banks exhibited specimens of this species which he found sucking the sap from maple stumps at Falls Church, Va., on the 14th of March and later dates. So intent or so intoxicated were they that they did not fly on repeated sweeping of the net in catching the flies, and a number of specimens were taken up with the fingers. All were males.

2. *Syrphus fisheri* Walton, in Virginia.

The author exhibited a specimen of this fly, described from Pennsylvania, which he had taken at Glencarlyn, Va., 14 July, and so determined by Walton.

3. Apterous Females of a Caddice-fly.

Specimens of *Philopotamus distinctus* Hag. were exhibited, mostly taken by Mr. Shannon near Plummer's Island, Md. The male was normally winged, but the females had the merest rudiments of wings. Since winged females of this species are well known, Mr. Banks considered that this apterism was due to some local cause, possibly operative only the present season.

4. Color in Hibernating *Chrysopa interrupta* Sch.

The author showed specimens of this rather uncommon chrysopid taken during the past winter by Mr. McAtee at Mt. Vernon, Va. The specimens were found in dry leaves clinging to a fallen tree. Many of the specimens were unmarked, but a number had a more or less extensive pattern of red markings on the head and thorax, possibly due to frost; one had a reddish head. No similar variation has been recorded in other chrysopids, and hibernation was previously unknown in this species.

5. The Genus *Ceratoacarus* Ewing (Acarina).

In the Ent. Tijdskrift for 1914, p. 186–187 Dr. Trägårdh calls attention to the fact that this genus is a synonym of *Labidostomma*, a fact that I recognized at once and wrote Dr. Ewing. Dr. Trägårdh takes this as an occasion to criticise American Acarologists for not knowing the literature of this group. Am I to judge all European Acarologists by the mistakes of a few?

I am familiar with all the literature cited by Trägårdh, and it is really he who does not know the literature. For he spells the genus *Labidostoma* several times, when it originally was spelled *Labidostomma*, and moreover he states that this record

of Dr. Ewing's is the first record of the genus in America. Such is not so. Stoll, in the Acari of the Biol. Cent. Amer., published over twenty years ago, describes a species from Guatemala (*Nicoletiella neotropica*).

PUPA OF BRACHYPALPUS FRONTOSUS Lw.

By H. L. Parker,
Bureau of Entomology.

A puparium of this rather common syrphid fly was found by the writer February 18 last on top of the mountain range lying south of Hagerstown, Md. It was under a growth of the moss *Polytrichium ohioensis* and was placed in a tin box and kept in a moist condition indoors. An adult fly emerged March 15, which was determined by Mr. Walton as *Brachypalpus frontosus* Loew. The puparium proper is 11 mm. long, of the usual syrphid shape, namely that of a pear flattened on one side, without lateral appendages and brownish in color. The anal end is produced in a distinct cauda about 4 mm. in length, bearing at its base three or four pairs of filamentous lateral appendages.

CAPTURES OF THE SYRPHID FLY, MERAPIOIDUS VILLOSUS BIGOT.

By R. C. Shannon,
Bureau of Entomology.

This fly has been recorded but three times, so far as the writer is aware, and recent captures by him and others may be of interest. Six specimens were taken at sap of sugar maple March 13 and 14, 1915, at Dead Run, Fairfax Co., Va. On the latter date, Mr. McAtee also took a specimen on a maple bud on Plummer's Island, Md., and Mr. Banks on the same day took two specimens at sap of swamp maple at Falls Church, Va. Four days later Mr. Greene and the writer each took a specimen at Dead Run, one at sap and the other resting on the trunk of a beech tree.

Bigot described this genus and species (Bull. Soc. Ent. de France, 1879, p. L) from Georgia. Williston recorded a specimen from Georgia (North American Syrphidæ, 1886, p. 244). This specimen and another collected by Morrison in North Carolina were the only examples in the National Collection. Metcalf (Syrphidæ of Ohio, Ohio State Univ. Bull., Vol. XVII, No. 31, p. 96. 1913) records three specimens from Ohio, two of them taken April

1 on *Salix* at Lakeville. The unusually early occurrence of this syrphid (before the appearance of the spring flowers) is probably the reason that it has been so seldom taken.

AN UNUSUAL COLOR IN A HORNET'S NEST.

By L. O. Howard.

Recently the Bureau of Entomology has received a specimen of the nest of the bald-faced hornet (*Vespula maculata* Linnaeus) from Mr. Arthur D. Addison of Washington, D. C. This nest was collected between Massachusetts and Cathedral Avenues and is remarkable inasmuch as it is irregularly striped with vivid blue. The blue stripes seem to be precisely of the same texture as the mottled gray covering of the nest. It is presumed that the blue stripes in this nest were made from a kind of building paper which workmen commonly use in the buildings in the suburbs. Mr. Addison notes that this nest was far removed from any building and it is doubtful where the wasps could have found access to such paper.

In discussing this paper Mr. Crawford stated that it was not at all uncommon for nests of this hornet to have stripes in them. One very often finds nests bearing a few very small white stripes evidently made when the wasps discover a supply of white paper.

The National Museum has on exhibit a very fine example of colored nest from Barto, Pennsylvania. In this example there is so much red that the nest may better be described as being red with grayish stripes. In this, the color appears to be due to the wasps having used cedar for the manufacture of their paper.

In the opinion of Mr. Crawford the striping is due to the concentration of work by the wasps along a narrow stripe, then their moving to another portion of the nest to work while allowing the first part to dry, and also to the well known habit of the social Hymenoptera when discovering a ready supply of building material or food to concentrate their efforts to carry it away. In this connection he stated that some accurate observations on both actual work of building and on securing the building material are greatly desired as our knowledge of these is very limited.

SOME GENERIC CORRECTIONS IN THE OPHIONINÆ.

By S. A. Rohwer, A. B. Gahan and R. A. Cushman,
U. S. Bureau of Entomology.

Tribe Anomalini = (Nototrachini)

Genus **Anomalon** Panzer.

Anomalon Panzer. 1805, Fauna Ins. German., H. 94, p. 15.

Type.—Anomalon cruentatus Panzer. Monobasic.

Syn. Trachynotus Gravenhorst. 1829, Ichnn. Eur., vol.3, p. 713 (nec Latreille).

Type.—Ophion foliator Fabricus. Monobasic.

Syn. Nototrachys Marshall. 1872 Trans. Ent. Soc. London, p. 260, new name for *Trachynotus* Gravenhorst.

Syn. Ochlerus Gistel. 1848, Naturg. Thierry, p. xl, new name for *Trachynotus* Gravenhorst.

When Panzer proposed *Anomalon cruentatus* in 1805 he established *Anomalon* as a monobasic genus. *Anomalon cruentatus* Panzer has remained in the literature as an unknown species. The only note which indicates its identity is that of Gravenhorst, 1829, Ichnn. Eur., vol. 3, p. 720, where under the discussion of *Trachynotus foliator* he states that he has received specimens labelled *Anomalon cruentatus* Panzer and that this is a black variety of *foliator* but he considers that *cruentatus* of Panzer is different from *foliator* because the ovipositor is longer than in the specimens of *foliator* which he had. By consulting the figure of *cruentatus* given by Panzer we can say that this species undoubtedly belongs to the genus *Nototrachys*, and from the specimens and literature available we are inclined to believe that *cruentatus* of Panzer is the same as or extremely closely allied to *foliator* Fabricius.

This information makes it necessary to consider *Nototrachys* and its various accepted synonyms as synonymous with *Anomalon* Panzer, and to change the tribe Nototrachini to Anomalini.

Therionini = (Anomalini Ashmead et Auctorum)

Genus **Therion** Curtis.

Therion Curtis. 1839, Brit. Ent., vol. 16, p. 736.

Type.—Ichneumon circumflexus Linnæus. Original designation.

Syn. Exochilum Wesmael. (1844) 1850, Bull. Acad. Sci. Belgium, vol. 16, pt. 2, p. 119 and 122.

Type.—Ichneumon circumflexus Linnæus. Monobasic.

Inasmuch as Curtis designated the type of *Therion* as *circumflexus* Linnæus the name *Exochilum* Wesmael which was proposed for the same species was unnecessary and as Curtis' genus antedates Wesmael's by ten years, *Exochilum* of Wesmael becomes a synonym of *Therion* Curtis, the two genera being isogenotypic.

Since *Anomalon* has to be used for *Nototrachys* (see above), the Tribe Anomalini of Ashmead and authors should be known under a name derived from that of the oldest genus which it contains. This is *Therion*, therefore the Anomalini of Ashmead and authors should be designated as Therionini.

Genus **Erigorgus** Förster.

Erigorgus Förster. 1868. Verh. Naturhist. Ver. Preuss. Rheinland, vol. 25, p. 146..

Type.—Anomalon (*Erigorgus*) *carinatum* Brischke. Monobasic by Brischke in 1880.

Syn. Barylypa Forster. 1868. Verh. Naturhist. Ver. Preuss. Rheinland, vol. 25, p. 146.

Type.—Anomalon (*Barylypa*) *genalis* Thomson. Included by Thomson in 1892 and designated by Viereck in 1911.

According to Szepligeti and Schmiedeknecht the types of the above mentioned genera are congeneric. It is therefore necessary to sink *Barylypa* of Förster to *Erigorgus*, as *Erigorgus* has line precedence.

The *Erigorgus* of Schmiedeknecht, Opusc. Ichn., vol. 4, 1908, p. 1484, is without a name but inasmuch as we are not sufficiently familiar with this genus we hesitate to propose a name for it especially as Szepligetti considers this group to be congeneric with the type of *Paranomalon* Viereck.

Two Hundred and Eighty-Sixth Meeting,

May 6, 1915.

The 286th regular meeting of the Society was entertained by Mr. E. A. Schwarz at the Sængerbund Hall, May 6, 1915. The following were present: Messrs. Baker, Barber, Böving, Burgess, Caudell, Craighead, Crawford, Duckett, Ely, Gahan, Greene, Heinrich, Howard, Jennings, Knab, Kotinsky, Middleton, Pierce, Rohwer, Rust, Sanford, Sasscer, Schwarz, Shannon, Turner, Walton, Wood, members, and Messrs. I. W. Davis, Dr. Güdmünd Hatt, W. C. O'Kane and L. H. Worthley, visitors.

At the close of the regular program Mr. Burgess, being called upon told in detail of the methods used and the success attained in the colonization of the egg-parasite of the gypsy-moth, *Anastatus bifasciatus*, in Massachusetts.

Mr. L. H. Worthley and Mr. I. W. Davis, visitors, were in turn called upon by the President and responded briefly.

THE USES OF CERTAIN WEEVILS AND WEEVIL PRODUCTS IN FOOD AND MEDICINE.

By W. Dwight Pierce.

Large quantities of pupal cocoons of a weevil were recently received by the Bureau of Chemistry from the American Consul at Constantinople under the name of trehala manna, an edible substance. Although there is some little literature on the subject it is mostly very inaccessible and practically unknown to American entomologists. A complete bibliography of the chemical phases of trehala has been prepared in the Bureau of Chemistry and was very kindly loaned the writer by Mr. C. S. Hudson.

It is not common for an insect to produce a substance which is edible for man, and that a weevil should be the maker is a matter of especial interest.

The first reference in literature properly classifying the maker of this substance is contained in a note by Guibourt (Revue et Magasin de Zoologie, 1858, ser. 2, vol. 10, p. 276) entitled "Notice sur une matière pharmaceutique nommée la Tréhala, produite par un Insecte de la famille des Charançons." He states that the cocoon is used for food in the Orient as commonly as salep and tapioca are used in France. His material was received from Roumelia and probably originated in Syria. Guibourt names the producer of these amylaceous cocoons *Larinus nidificans*, but does not supply any further description.

About the same time as the publication of Guibourt's note, M. Berthelot made a chemical study of the product and published an article entitled "Sur le tréhalose, nouvelle espèce de sucre" (Comptes Rendus de l'Academie des Sciences, vol. 46, June 1858, pp. 1276-1279). This substance trehalose is analogous to cane sugar, with the formula $C_{12}H_{22}O_{11}$ as indicated by modern chemistry. At ordinary temperatures it retains two molecules of water of crystallization. The properties are quite fully discussed.

It is interesting to note that trehalose was first obtained from the ergot of rye, that it is derived from many species of mushrooms, from *Aspergillus niger*, and also from the resurrection plant (*Selaginella lepidophylla*).

A very full discussion by Daniel Hanbury followed these preliminary notes in an article entitled "Note on two insect-products from Persia" (Journal of the Proceedings of the Linnean Society, Zoology, vol. 3, 1859, pp. 178–183, figs. 1–3). Hanbury carefully reviews the earlier literature on tréhala, which he also calls tricala, citing the early Persian names for it (Shakar-elma-ascher) and stating that the first reference to the substance was made by Father Ange in his "Pharmacopœa Persica" in 1681. He describes the cocoons as ovoid or globular, about $\frac{3}{4}$ of an inch long; their inner surface composed of a smooth, hard, dusky layer, external to which is a thick, rough, tuberculated coating of a greyish-white color and earthy appearance. They are made on the stems of *Echinops* and sometimes contain spiny portions of the leaves. The maker of the cocoons seen by him is *Larinus maculatus* Faldermann a species closely related to *nidificans*, as later defined by Capiomont and Leprieur. *Larinus maculatus* occurs in European Turkey, Caucasus, Persia, Barbary and Portugal.

Hanbury cites Dr. Honigberger as saying that these insect nests are imported into Lahore from Hindustan, and that trehala is abundant in the shops of the Jew drug-dealers of Constantinople, where it is frequently used by the Arab and Turkish physicians in the form of a decoction, which is regarded by them as of peculiar efficiency in diseases of the respiratory organs.

In the above cited work Hanbury also calls attention to the production of a saccharine substance resembling dark honey made by the punctures of *Larinus mellificus* Jekel, in the stems of *Echinops* in Persia. Dr. Heyden in 1880 (Le Naturaliste, vol. 2, 237) quotes *Larinus mellificus* as a synonym of *L. nidificans* Guibourt. It would therefore seem that the adult in puncturing *Echinops* causes a flow of honey, while the larva after feeding to maturity constructs a saccharine cocoon.

In the same year Gervais and van Beneden in their Zoologie Medicale (Paris, 1859, pp. 311–313) give more details as to the uses of trehala. To obtain the decoction used in diseases of the respiratory organs, especially bronchial catarrh, a litre of boiling water is poured over about 15 grams of cocoons, this is stirred for about a quarter of an hour and then boiled, and the decoction is drunk by the patient without being filtered. They refer to the maker of the cocoons as *Larinus syriacus* Chevrolat found on *Onopordon* on the desert between Aleppo and Bagdad. The cocoons must be collected before the weevils emerge and it is thought probable that the latter have a part in the medicinal action of the trehala.

Various other short articles bearing upon the subject have been published but all are cited in the works here mentioned.

In their monograph of *Larinus*, Capiomont et Leprieur (Ann. Soc. Ent. France, ser. 5, vol, 4, 1874, p. 65) give a full description of *Larinus nidificans* Guibourt. They cite its origin as Syria and Persia. The cocoon is said to taste sweet and to swell in water without completely dissolving even after long boiling. It contains 66 per cent of a substance similar to sago, a little gum, a small amount of inorganic mineral matter, and 28 per cent of the sugar called trehalose. The natives use it in a decoction against bronchial catarrh and as a food like tapioca. The sago-like substance has been chemically named trehalum. It is a tasteless carbohydrate, with the formula $C_{24}H_{42}O_{21}$.

A very concise summary is also given by Bargagli (Rassegna Biologica Rincofori Europei, 1883–7, pp. 110, 111) of the habits

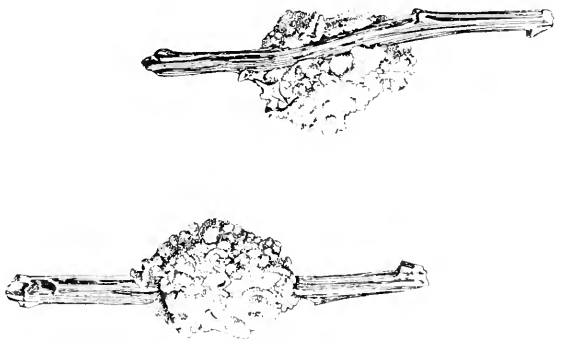


Fig. 1. Larinus nidificans. Pupal cells.

of the weevil and of the nature of its cocoon. Bargagli cites the names of the substance of the cocoons as thrane, thrale, trehala, tricara and tricala. The cocoons are gathered before the weevils mature.

The specimens exhibited are the *Larinus nidificans* Guibourt as defined by Capiomont and Leprieur. Fragments of the plant were submitted to Mr. Paul C. Standley and determined by him as a species of *Echinops*.

The genus *Larinus* is confined in its habits to breeding on Compositæ related to the thistle. The larvæ usually feed at the base of the flower head and then construct a cocoon (fig. 1) This cocoon is made by abdominal excretion, and causes the larva to diminish considerably in size during its construction.

Gervais and Van Beneden as well as other authors quote Gerbi's reference to the use of the larvæ of *Rhinocyllus antiodontalgicus*

Gerbi, a species nearly related to *Larinus*, in certain parts of France, for toothache and inflammation of the gums. Merely touching the insect to the aching part was claimed to give relief. This antiodontalgic property is also ascribed by Gerbi to various other weevils, such as *Rhynchites bacchus* and *R. betuleti*, and *Larinus jaceae*.

Incidentally it may be stated that various authors cite the fact that the larvæ of the palm weevil (*Rhynchophorus palmarum* Linnaeus) are considered a very delicious food by the natives in Central America. The larvæ are roasted and when properly cooked are esteemed rich and delicate eating. There are also suggestions in the literature as to the edibility of *Calandra chinensis*.

THE SECRETIONS EMPLOYED BY RHYNCHOPHOROUS LARVÆ IN COCOON-MAKING.

By Frederick Knab, *Bureau of Entomology*.

The question of the source of the substance constituting the bulky cocoons of *Larinus* shown by Mr. Pierce is an interesting one. There is good reason to believe that it is at least for the greater part a product of the malpighian tubes, and therefore voided through the anus. Moreover, it would seem that such is the origin generally of the cocoons of very diverse structure and texture constructed by the larvæ of many genera of Rhynchophora at the time of pupation. The viscous secretion covering the bodies of certain externally feeding weevil larvæ is undoubtedly from the same source.

In the discussions of the biology of certain weevils one frequently finds the statement that the larva "spins" the cocoon, the impression conveyed being that the process is analogous to the cocoon spinning of lepidopterous larvæ. Indeed, labial spinnerets occur in some weevil larvæ,[1] and it can not be altogether denied that some of them "spin" in the restricted sense; but this organ is very minute, so that its rôle must be a very subordinate one. It seems probable that the rectal glands contribute also to the cocoon-forming substance, and possibly there is still another contributing source, the surface glands distributed over the body. Thus, the cocoon may be composed of material from four distinct sources, just as Dr. Böving has demonstrated in such an excellent manner for *Donacia*.[2]

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[1] Henneguy, L. F. Les Insectes, p. 462. 1904.

[2] Böving, Adam Giede, Natural history of the larvæ of Donaciinæ. Internat. Rev. d. gesamten Hydrobiol. u. Hydrogr., vol. 3, Biol. Suppl. 1, 108 p., 7 pls. 1910.

My interest in the subject was awakened in 1902, by finding the larvæ of *Calogaster lituratus* Dietz, which are external feeders and cover themselves with their own dung in the manner of the larvæ of *Lema*. It was found that these larvæ of *Calogaster* were completely enveloped in a transparent viscous coating. Later, opportunity was found to investigate the production of such a secretion in the larva of *Hypera punctata*,[1] conflicting statements having been found in the literature. Thus De Geer[2] and Lacordaire,[3] discussing the larva of *Hypera*, state that it is covered with a viscous substance which aids it in locomotion and enables it to cling to its food-plant. Goureau could perceive no such viscous substance and asserted that the larva moved and maintained its position solely by means of the series of ventral tubercles. He believes that the open-meshed cocoon was spun as in lepidopterous larvæ.[4]

Perris, in his earlier writings on the subject, takes issue with these authors and asserts that in *Cionus*[5] and *Hypera*[6] the viscous substance is secreted from a papilla situated basally on the upper side of the twelfth body-segment and that the substance is carried forward by peristaltic movements of the body. This papilla is stated to be ordinarily hidden, but protrusile. Perris states that the cocoons are formed of this same viscous substance, drawn from its source by the aid of the mandibles and palpi. We find the positive assertion that the threads of the open-meshed cocoons of *Hypera* do not come from spinnerets near the mouth, but are drawn from the gland at the base of the twelfth segment. The statement of Perris, that the viscous secretion of the larva of *Hypera* proceeds from a tubercle on the twelfth body-segment, appears to have been very widely accepted and is repeated even in works of recent date. We find it, among others, with Taschenberg,[7] Bargagli[8] and Lumardoni.[9] But the impression gained is that these statements are not based upon original observation.

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[1] The name *Hypera* is used here in the broader sense as synonymous with *Phytonomus*, over which latter it has priority.

[2] De Geer, Carl. Mémoires pour servir a l'histoire des insectes, vol. 5, p. 233. 1775.

[3] Lacordaire, J. Th. Introduction à l'Entomologie, vol. 1, p. 103. 1834.

[4] Goureau. Note pour servir à l'histoire du Phytonomus rumicis. Ann. Soc. Ent. France, ser. 2, vol. 2, p. 49–59. 1844.

[5] Perris, Edouard. Notes pour servir à l'histoire des Cionus. Ann. Soc. Linn. Lyon, vol. 2, p. 25–29. 1850.

[6] Perris, Edouard. Notes pour servir à l'histoire des Phytonomus et des Phytobius. Mém. Acad. Sc. Lyon, ser. 2, vol. 1, p. 93–106. 1851.

[7] Taschenberg. Praktische Insekten-Kunde, part 2, p. 123. 1879.

[8] Bargagli, Piero. Rasegna biologica di rhincofori europei. Bull. Soc. Ent. Ital., vol. 15, p. 319. 1883; vol. 16, p. 165. 1884.

[9] Lumardoni, A. Gli Insetti nocivi, vol. 1, p. 339. 1889.

Careful and repeated examination of larvæ of *Hypera punctata* convinced me that no such tubercle exists. Furthermore, larvæ were observed at various stages in the process of constructing their cocoons. It could be readily perceived that the thick irregular threads of viscous substance were drawn forth from the anus by means of the mouth-parts, and there could be no doubt as to the origin of at least the bulk of the material. Finally, dissections of *Hypera* larvæ showed an enormous development of the malpighian tubes; just what one could expect to find under the circumstances.

Perris evidently could not afterward verify the presence of the tubercle he had indicated in his earlier writings as the source of the secretion. In his great work on the larvæ of the Coleoptera,[1] which I have only recently had opportunity to examine, we not only find no mention of the tubercle, but in connection with several genera the positive statement that the secretion in question issues from the anus. Under *Hypera* (p. 385) we find the following: "They have the faculty of secreting from the anus a mucilaginous and viscous substance which spreads over the body in a very thin layer, principally over the ventral surface, and effectively aids them in maintaining their position. This same substance, wholly insoluble in water, as it should be, also assists them when they are about to transform to attach themselves to some point, either upon the food-plant itself or to any other, and finally they employ it to surround themselves with an elegant irregularly reticulate cocoon constructed by drawing forth the mucilage in threads by the aid of their mandibles and palpi and the movements of the body."

A statement of the same import occurs under the genus *Cionus* (p. 404–405): "They are habitually covered with a mucilaginous substance which escapes from the anus and is spread over the body by the peristaltic movements of the segments. At last they produce this substance in larger quantity, they allow it to harden, and thus they find themselves enclosed in a parchment-like cocoon which remains attached to the leaves, stalks or flowers."

Perris observed that even the internally feeding forms construct their cocoons by the same process. Under *Orchestes* (p. 402), whose larvæ are leaf-miners, we read: "At the last the larva surrounds itself with a cocoon which it forms with the aid of its mandibles and palpi from a mucilaginous substance which issues from the anus."

J. A. Osborne, an English observer, makes a brief corroborative statement. "The spinneret of the larva of *H. rumicis* is anal."[2]

[1] Perris, Edouard. Larves de Coléoptères. Paris, 1877.

[2] Osborne, J. A. On the cocoons formed by Hypera rumicis and its parasites, and Cionus scrophulariæ. Ent. Mo. Mag., vol. 16, p. 16–18, 1879.

C. V. Riley took exception to this statement and in contradiction says: "*Ph. punctatus* spins with its mouth, bracing itself against the part of the cocoon already formed while constructing the remainder. The silk issues from the spinneret in a very perceptibly liquid condition, but soon hardens, . . ." The employment of the viscous secretion from the anus to aid in locomotion is indicated on the preceding page.[1]

This observation by Riley, of the employment of the labial spinneret by the larva of *Hypera* in the construction of its cocoon, is partly corroborated in a recent paper by Folsom, who says: "The actual spinning is done with the mouth. . . . At intervals the supply of silk fluid in the mouth gives out; then the larva reaches back to the end of the abdomen and by an assiduous process of nibbling secures a new supply of silk fluid from the rectum, and resumes its spinning. This performance always occurs, and can be observed easily with a hand lens in the earlier stages of cocoon-spinning. Riley and J. A. Osborne were each partly correct in their accounts of the spinning."[2]

These statements, finally, are again opposed by C. N. Ainslie, who is quoted by F. M. Webster as follows: "Instead of spinning the silk from a gland that opened into its mouth, as was supposed, the fluid from which the silk is made is taken into the mouth apparently from a gland in the caudal segment. The larva applied its mouth to an opening or gland close to the anus."[3]

In conclusion may be mentioned an observation by Montandon, recorded by Bourgeois, that the larva of *Herpes porcellus* (Byrsopidæ) makes a reticulate cocoon similar to that of *Hypera* and composed of an anal secretion.[4]

The statements by Riley and Folsom, that the larva of *Hypera* spins from a labial spinneret, should not be denied altogether. But it appears certain to me that the bulk of the cocoon-forming substance is produced from the anus and primarily from the malpighian tubes. Perhaps the lesser supply from the silk glands has some special function. Not improbably it is applied as a coating over the coarser threads from the rectum, to make them insoluble to water. I have noted that the larva passes its mouth along the threads after they have been drawn out and put in place, and it

[1] Riley, C. V. Report of the Entomologist. Rept. Comm. Agric. for 1881 and 1882, p. 174, 175. 1882.

[2] Folsom, J. W. The insect pests of clover and alfalfa. Univ. Illinois Agr. Exp. Stat. Bull. 134, p. 161. 1909.

[3] Webster, F. M. Preliminary report on the alfalfa weevil. U. S. Dept. Agric., Bur. Ent., Bull. 112. 1912. (P. 23, quotes C. N. Ainslie.)

[4] Bourgeois, J. Contribution à l'étude des métamorphoses de l'*Herpes porcellus* Lacord. Bull. Soc. Ent. France, 1906, p. 94–95.

seems plausible that at this time the silky coating is being applied. An investigation of the character of the different secretions would easily decide this question.

NOTES ON NORTH AMERICAN CHLOROPIDÆ (DIPTERA).

J. R. Malloch,
Illinois State Laboratory of Natural History.

In a paper which presented a generic synopsis of the family Chloropidæ[1] I described an insect which at the time I considered as a possible variety of *Chloropisca glabra* Meigen, giving it the varietal name *clypeata*. Since writing that paper I have obtained a number of specimens of *clypeata* from different localities, and an examination of these has convinced me that they belong to a species that is distinct from *glabra; clypeata* should therefore be used in a specific instead of a varietal sense.

The species is distinguished from *glabra* by its larger size, averaging 3 mm., and by the differently shaped frontal triangle, which is comparatively longer and narrower than in *glabra*, with its sides converging appreciably less from front ocellus to anterior margin. The fore tarsi usually have the whole of the first joint and the basal portion of the second yellow, whereas in *glabra* both joints are blackened except, rarely, the base of the first joint, the clypeus also is generally yellow, very rarely slightly brownish.

In addition to the Illinois localities given in connection with the original description—Algonquin and Urbana—I have taken specimens at Centerville, August 16, and at Monticello, June 21; and I have seen specimens from Plummer's Island, Md., July 4 and 19, and from Anacostia, D. C., July 22,—taken by W. L. McAtee and W. D. Appel.

The following new species were taken by Mr. C. A. Hart and the writer in 1914.

Chloropisca parviceps, n. sp.

Female. Glossy yellow. Head yellow; occiput black, slightly shining; frontal triangle glossy black; basal joints of antennæ brownish black, upper margin of third broadly brown; arista fuscous, yellowish at base; face paler than frons; mouth parts entirely yellow. Disc of mesonotum glossy black, shading off into the yellow lateral margins; humeri with a large, poorly defined black spot; mesopleural spot black; sternopleural one yellowish red; scutellum with sides black at base, the remainder glossy yellow. Dorsum of abdomen glossy blackish brown, the posterior margins

[1] Can. Ent. vol. XLVI, 1914, p. 115.

of segments very narrowly yellowish, most noticeably so on the posterior lateral angles. Legs entirely yellow. Wings clear, veins fuscous.

Frons slightly wider than either eye; triangle very large, occupying the entire frons with the exception of a narrow stripe on each side of nearly same width as the anterior ocellus extending almost to the anterior margin, where the sides converge, forming a rather obtuse apex; frontal hairs weak; those on the lateral submarginal line of triangle most distinct; third antennal joint large, slightly longer than broad, rounded at apex; arista almost bare, slightly longer than width of frons anteriorly; profile of head slightly retreating towards mouth; cheeks linear, barely distinguishable. Disc of mesonotum with short, rather closely placed, blackish hairs; scutellum rather short, less noticeably flattened and more rounded than in most species of the genus, disc with several short black hairs, the apical pair of bristles rather widely separated, not cruciate. Legs slender; fore tarsi not broadened; sensory area on hind tibiæ half the length tibia. Inner cross vein of wing distinctly before apex of first vein; third and fourth veins almost straight; penultimate section of fourth vein about a third as long as ultimate section of fourth and subequal to last section of fifth. Length, 1–1.5 mm.

Type locality: Monticello, June 30. Paratypes from Centerville, August 16, and Mohamet, August 6,—all in Illinois.

C. grata Loew differs from *parviceps* in having the frontal triangle gradually tapering from vertex to anterior margin, the cheeks nearly as broad as third antennal joint, the scutellum conspicuously flattened, bare, with noticeable "rim," and the apical pair of bristles closely placed and generally cruciate; also differs in several minor respects.

Genus Gaurax Loew.

Through a mistake in selecting the type of the genus *Neogaurax* the writer, in the paper already referred to, inadvertently created a synonym of *Gaurax*, as its type possesses the generic characters of *Neogaurax*. It thus becomes necessary to rename the genus which contains the forms having the scutellum much elongated, flattened dorsally, and ending in an obtuse point, and I here propose for it the name **Pseudogaurax,** with the genotype *Gaurax anchora* Loew.

In describing 2 new species of *Gaurax* I take the opportunity of presenting a synoptic key for the separation of the described species of the genus. I am indebted to Prof. J. M. Aldrich for an opportunity to examine a specimen of *G. ephippium* from Mrs. Slosson's collection. I have added *dorsalis* Loew and *pilosula* Becker to the species already included in the genus as they obviously belong there. I have taken the former in Illinois, but the latter I have not seen. I am indebted to Professor Aldrich for in-

formation regarding the type of *pilosula* which has enabled me to place it correctly in the key and also for confirmation of my opinion as to its generic position.

KEY TO SPECIES.

1. Wings not entirely hyaline, either with a spot at apex of second vein or with a distinct infuscation 2
   Wings entirely hyaline 5
2. Wings with a small black spot at apex of second vein (Toronto, Can.). *pseudostigma* Johnson
   Wings with their greater portion infuscated 3
3. Thorax and scutellum black (Ill.) ..... *fumipennis* Malloch
   Thorax mostly yellow and scutellum entirely so 4
4. Third antennal joint black; mesonotum without a white spot behind humeri (N. H.) ..... *obscuripennis* Johnson
   Antennæ entirely yellow; mesonotum with a white spot behind humeri. *splendidus*, n. sp.
5. Halteres yellow 6
   Halteres with at least the knob black 7
6. Scutellum black (Pa. Ill., N. H.) ..... *dorsalis* Loew
   Scutellum yellow (N. H.) ..... *ephippium* Zetterstedt
7. Legs entire yellow (N. H., Vt.) ..... *montanus* Coquillett
   Legs with distinct black marks 8
8. Thorax glossy black, lower half of pleuræ and scutellum yellow (Ill.). *apicalis*, n. sp.
   Thorax and scutellum yellow, disc of mesonotum with black marks (Pa.) ..... *festivus* Loew
   Thorax and scutellum glossy black (La.) ..... *pilosula* Becker

Gaurax apicalis, n. sp.

Female. Glossy black. Head orange-yellow; occiput and frontal triangle glossy black, sides of frons posteriorly brownish; face whitish yellow; antennæ yellow, third joint reddish above; clypeus blackish; palpi and proboscis yellow. Thorax glossy black, lower half of pleura and scutellum pale yellow. Dorsum of abdomen glossy black, venter obscurely yellowish, subopaque. Legs whitish yellow, a streak of postero-ventral surface of apical fourth of mid femora and the whole of the apical fourth of posterior surface of hind femora black. Wings clear, veins brown. Halteres yellow, knob black. Short hairs on body and legs pale, bristles black.

Frons slightly broader than the combined width of eyes, and, posteriorly, broader than long, the sides convergent anteriorly; triangle extending beyond middle of frons, equal-sided, the lateral margins slightly convex; orbits with rather strong hairs; antennæ of moderate size, third joint disc-like; arista slightly longer than anterior width of frons, hairs sparse, upright, not very long; cheeks almost indistinguishable. Disc of meso-

notum with short, rather closely placed hairs, the surface without distinct punctures; scutellum convex, short, rounded in outline, two long apical and two shorter subapical bristles on margin. Abdomen shorter than head and thorax combined. Legs rather long and moderately stout; sensory area of hind tibiæ not darker than surrounding portions. Penultimate section of fourth wing-vein twice as long as basal portion of third and distinctly, but not greatly, shorter than ultimate portion of fifth. Length, 2 mm.

Type locality: Mahomet, Ill., August 6, 1914 (J. R. Malloch).

Gaurax splendidus n. sp.

Male. Yellow, variegated with black. Head yellow; frons orange-yellow, opaque, triangle glossy, the upper margin blackened, vertex and occiput black; face, antennæ and arista reddish yellow; palpi pale yellow. Mesonotum honey-yellow, with the following black marks,—a narrow line on anterior margin, a small spot behind each humerus, and a broad dorso-central stripe which does not extend to anterior margin and is connected with a lateral tridentate mark on posterior margin, the outer portion of the latter being indistinctly connected with a spot on lateral margin at suture; anterior to the black lateral spot at suture is a large milk-white spot on each side; pleuræ blackened on upper half except one or two small portions where the yellow ground-color shows; scutellum lemon-yellow; surface hairs on thorax silvery white, scutellar hairs and bristles yellow. Abdomen black, yellow at base and on a narrow dorso-central line on second segment; venter greenish yellow; hypopygium black. Legs whitish yellow, blackened on apical half of anterior and postero-ventral surfaces of mid femora, apical half of posterior femora, with the exception of a narrow portion which divides the black mark, and the mid and hind tibiæ, except their bases and apices. Wings clear at extreme base, posterior to fifth vein up to cross vein and beyond that point posterior to fourth vein, the remainder black with the exception of a very narrow clear line along posterior margin of fourth vein from base to cross vein. Halteres yellow, knob black.

Head, viewed from above, twice as broad as long at center; frons more than one-third the head-width and distinctly broader than long, triangle extending more than midway to anterior margin; post-vertical bristles long, cruciate; surface of frons with a few hairs, a cruciate pair noticeable on center of anterior margin; antennæ normal in size, third joint very densely pilose, arista swollen at base, the hairs sparse and very distinct; cheek linear, with numerous hairs; eyes distinctly higher than long, surface hairs distinct. Mesonotum with silvery hairs which are most conspicuous when viewed from in front; scutellum with two long, cruciate apical bristles, and two much shorter ones which are not exactly on the margin but a short distance from it, on the disc. Abdomen tapering; hypopygium very conspicuous, recurved beneath abdomen, each of the lateral

arms ending in a rather prominent flattened process. Legs normal, the hind tibial sensory area distinct. Venation as in *apicalis*. Halteres with conspicuously elongated knobs. Length, 2.5 mm.

Type locality: White Heath, Ill., collected by sweeping herbage on bank of the Sangamon River, May 30, 1915 (J. R. Malloch).

This species was noticeable in the net by its very rapid motions, running swiftly up the sides, much more like a phorid than a chloropid, the latter being usually very slow and deliberate in action.

Botanobia (Oscinis) proxima Malloch.

This species is, I am convinced, a synonym of *minor* Adams. I have taken it in numbers in Illinois, and have reared it from volunteer wheat at Urbana.

Genus Pseudochlorops Malloch.

This genus was founded upon leg characters which readily separate the genotype from any species of the genus *Chlorops* and point to its much closer affinity with *Chloropisca*. An examination of a larger number of species of the latter genus than was possible at the time I erected the genus leads me to believe that although the scutellum in the genotype of *Pseudochlorops* is not so conspicuously flattened as that in most species of *Chloropsia*, its possession of a flattened area bounded by a weak "rim," renders it so unessentially different in structure from *Chloropisca* that it should not be considered as entitled to distinct generic rank.

Professor Aldrich informs me that the specimens named *Chlorops unicolor* Loew in the U. S. National Museum are misidentified, being *C. integra* Becker. This species therefore goes in *Chloropisca* and *Pseudochlorops* falls as a synonym of that genus.

A NEW NOCTURNAL SPECIES OF TACHINIDAE.

By W. R. Walton,

Bureau of Entomology, Cereal and Forage Insect Investigations.

Neophyto nocturnalis n. sp.

General color obscure grayish, head obtusely conical, antennæ very short, wings narrow, slightly infuscated especially bordering veins. Length 6–9 mm. Front in female one and one-third, in male, one-half eye width; cinereous, vitta nearly black; two pairs of orbitals in female, absent in male. Several pairs of smaller bristles, back of the ocellar pair. Frontals (fig. 1) not descending below base of second antennal joint in female, but ending distinctly above same in male. No frontal bristles directed distinctly backward. Antennæ black, third joint in either sex subequal with second, tip of antennæ descending but little below lower

margin of eyes. Arista black, bare, bulbous at extreme base. Facial plate very small, vibrissal angles closely approximated, vibrissæ rather weak, but distinct and strongly cruciate, situated well above oral margin. Cheeks in both sexes nearly as wide as eye-height, the anterior two-thirds occupied by the transverse impression which is greatly expanded and dark brown in color. Posterior part of cheeks and occiput cinereous. Facial ridges practically bare. A row of long, slender, ventrally directed macrochætæ extends on the face from opposite tip of second antennal joint to lower corner of eye, the longest of these subequal in length with arista. Front, on the sides, clothed with short black hairs arranged in more or less regular rows. Proboscis extremely short, labella fleshy, brown, palpi black, bearing a distinct brush of forwardly directed bristles at their tip. Thorax grayish brown, vittæ indistinct, pleuræ cinereous, sternopleurals usually three, many long erect hairs also present near them.

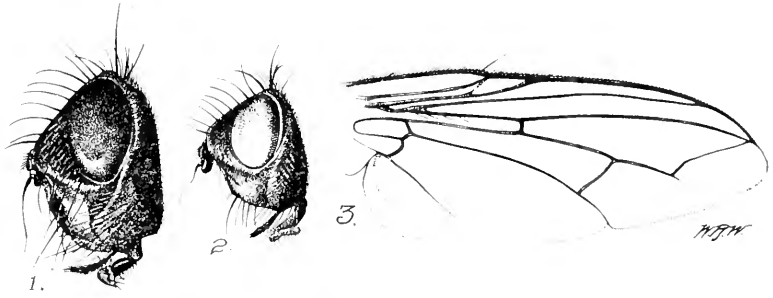

Fig. 1–3. Neophyto nocturnalis Walton.

Dorso-central bristles three; sometimes an irregularly placed fourth one present. Scutellum bearing three strong pairs of marginals, apical pair obsolete. Disc of same in the male bearing many long, nearly erect hairs, in addition to a discal pair. Abdomen elongate ovate in female, distinctly elongate and nearly cylindrical in male, slightly marmorate or pseudo-maculate as viewed from the rear. Also traces of a median vitta present in well-preserved specimens. Each segment bearing both discal and marginal macrochætæ although the former are sometimes asymmetrically placed. A slightly metallic sheen apparent on the darker portions of segments. Genitalia in both sexes retracted. Legs, including coxæ black, claws of male elongated, pulvilli fuscous. Wings (fig. 3) narrow, veins distinctly black. Costal spine fully as long as small cross vein. Apical cell closed slightly before costal margin entering same well before tip of wing. Bend of fourth vein distinctly angulated, bearing a wrinkle. Third vein bristly, nearly half way to small cross vein, squamæ yellowish white, head of haltere fuscous. The posterior cross vein in this genus is subject to freakish developments; a specimen of *setosa* Coq. (fig. 2) in the

National Museum collection bears stumps of veins on both the inner and outer sides of this vein while one of the females in the series before me possesses an extra short vein, originating at the middle of the posterior cross vein (which is bent outward at a distinct angle) and running parallel with the fourth vein, before its bend, nearly to posterior border in either wing.

Species described from four specimens, male and female, all collected at electric lights at night, Forest Glen, Md., by Mr. Otto Heidemann, April 19 to 28, 1914.

Structurally this species closely resembles *setosa* Coq., but differs as follows: Wing veins black, wings distinctly smoky, entire body pollinose and much darker in general color. Sides of face in transverse depression much darker brown, abdomen with reflecting spots, head more obtusely conical in side elevation, average size much larger. It is possibly entirely and certainly partially nocturnal in habit of flight. Judging from this fact and the habitus of the fly it seems probable that this genus is parasitic upon nocturnal Coleoptera, possibly *Lachnosterna*.

Mr. R. C. Shannon has previously[1] mentioned the nocturnal habit of this interesting fly.

A FEW NOTES ON THE HABITS OF PARASITIC HYMENOPTERA.

By W. Dwight Pierce and R. A. Cushman,
Bureau of Entomology, U. S. Department of Agriculture.

In the course of several years spent in the study of parasites a number of interesting observations have been made which are of interest to the biological entomologist but have no direct bearing upon any economic problem. A few of these records which are considered worthy of publication have been gathered together to form the present paper.

Among the hymenopterous parasites sexual attraction seems to be a strongly developed instinct. In the Braconidæ under observation there is no courtship, the mating taking place almost immediately. This was first observed and noted for *Sigalphus curculionis* Fitch on April 30, 1908 (W. D. P). The male whenever it came close to the female fanned its wings very rapidly and finally jumped on her back, but was off in a second. A little later it approached again and this time was attached for forty seconds. Observations of other braconids were of the same nature.

Among the Chalcidoidea studied, a very interesting courtship always precedes mating. On June 15th the actions of a pair of

[1] Proc. Ent. Soc. Wash., vol. XVI, 1914, p. 182.

Catolaccus incertus were observed for forty-five minutes (W. D. P.). During this time the male was on and off, but for thirty minutes in all he was perched on the back of the female. He was only one-half her length and as he rested on her thorax, with his front feet placed on her face, his hind legs rested on the apex of the thorax, and the tip of his abdomen reached no further. The wings of the male were upright while those of the female lay in repose. The antennæ of the latter were very active, communicating a message by some wigwag code, now one, now both, now fast, now slow, tapping the face of her mate or moving in his sight; and in response, the antennæ of the male frequently came down and touched the tips of her antennæ or tapped on her face. His antennæ were, however, much oftener quiet and pointing to the front. Another peculiar action was the sudden darting back to the abdomen, which was sometimes forced by the female pushing the male back with her hind legs, but he each time, ran back to his original position or jumped off. The male seldom was aware of the presence of the female at a greater distance than a quarter of an inch, but the latter's perception was much greater. When conscious of his mate's presence the male's antennæ were very active in dispatching a wireless message, only ceasing when it was again perched on her back. The actual copulation was not witnessed.

On September 10th, the courtship of a pair of *Cerambycobius cushmani* Crawford bred from huisache pods was recorded (R. A. C.) This was conducted very differently from that just described and so is worthy of equal mention. They first met face to face and the male began stroking her antennæ which were held up in front of his face. After doing this for a few seconds he jumped on her back and continued very rapidly stroking her antennæ, which were held up in front of his face. This action lasted for some seconds, and he then walked backwards down under the end of the female's abdomen until the tip of his body was just under the anterior end of her abdomen, when the connection took place. This did not last more than a second. When the male left the female his copulatory organ was still protruding about one thirty-second of an inch and appeared black and chitinous. In a few seconds the process was repeated exactly as before except that the copulatory organ was retracted before the male left the female.

The courtship and mating of *Eurytoma tylodermatis* Ashmead and *Microdontomerus anthonomi* Crawford, *Bracon mellitor* Say, *Urosigalphus bruchi* Crawford and *Microbracon mayorus* Say were also witnessed, but not recorded. Several experiments were conducted to settle the specific distinction between *Cerambycobius cyaniceps* Ashmead and *Cerambycobius cushmani* Crawford. In no case did the one species pay any attention to the opposite sex

of the other, thus partially proving them to be distinct, while on the other hand it was an easy matter to induce courtship between the two sexes of the same type.

The sexes are usually of quite different size, the female frequently being three or four times the size of the male. The size is determined partially by the amount of the food supply, there being large and small males and females, although the majority of the small individuals are male and of the larger individuals are female.

By means of a mica plant-cage some very interesting observations were made upon the method of oviposition by several of the species. On October 6, 1908, a female *Catolaccus incertus* was observed (R. A. C), crawling on an infested square and tapping it here and there with her antennæ. She finally inserted her ovipositor in the last spot investigated. This was done in the following manner. She raised herself to the full extent of her legs and at the same time dropped the tip of the abdomen until it touched the square, when the abdomen was practically perpendicular to the square. After holding this position for a second, during which time she made several jabs with the sheath, the abdomen was straightened out to the normal position while the ovipositor still remained inserted in the square. In forcing the ovipositor in, she moved the abdomen from side to side and the venter was pushed down until the abdomen became triangular in profile. The effort was not successful.

On September 14, 1908, at Arkadelphia, Arkansas, the late Mr. Clarence E. Hood observed a *Catalaccus hunteri* Crawford ovipositing in a dry square. The ovipositor was nearly halfway into the square when first seen, and the triangular process at the base of the ovipositor was plainly visible. The ovipositor was perpendicular to the line of the body on the anterior ventral part of the abdomen. The operation of forcing the ovipositor into the square worked on the principle of an augur, with the ovipositor as the bit and the body as the brace. By turning around and around the ovipositor was forced into the square its entire length. The parasite then remained practically quiet for perhaps two minutes, a very slight movement of the abdomen being the only action noticed. After the operation was finished the ovipositor was very suddenly removed and snapped back into the sheath.

On October 23, 1908, at Natchez, Miss., one of us (W. D. P.) picked up a square from a plant and found a female *Catolaccus hunteri* with its ovipositor inserted to the limit. The abdominal triangular process was very large. The female did considerable turning to right and left, sometimes going almost around the ovipositor and then turning back the other way. The operation complete, the abdominal process was drawn in, but the ovipositor still remained inserted in the square. She walked

around it several times before she could pull it out. It was replaced slowly in the sheath. During the long operation the antennæ hung pendant in front of the eyes. This observation was made shortly after 3.30 p.m. and lasted eighteen minutes.

On October 2, 1908, at 3.30 p.m., the authors and Mr. Hood were able to observe the oviposition of a female *Crambycobius cyaniceps* Ashmead. The parasite having located with her antennæ a suitable spot, walked ahead until her abdomen was directly over the spot, then raising the abdomen and at the same time curving it beneath until the ovipositor sheath was perpendicular to the square at the spot selected. With a sudden jabbing movement the square was pierced. The sheath was removed immediately and the abdomen straightened to its normal position. The ovipositor being still in a vertical position, was quickly inserted its entire length. Then by an up and down movement the portion of the abdomen at the base of the ovipositor was pushed out into a triangular process. During the process of oviposition the abdomen was moved from side to side and the ovipositor was frequently drawn partially out and again inserted. During the operation, which lasted about four minutes, the antennal flagella were hung in a downward vertical position in front of the face. When the process was completed the ovipositor was withdrawn very suddenly and snapped back into the sheath.

On October 6, 1908, this same species was observed trying to oviposit at 9.00 a.m. at a temperature of 69° and under a cloudy sky. At 11.00 o'clock on the same day, with a temperature of 70° and the sky 100 per cent cloudy, a female was observed to oviposit, taking seven minutes for the process. Observations on this day were continued and the parasites were found to work at all times of the day and in all conditions of sunlight. The longest period of oviposition which was recorded lasted fifteen and a half minutes.

On November 2, 1908, at 11.00 a.m., Mr. Hood recorded the oviposition of *Sigalphus curculionis* Fitch. The female crawled over the square, feeling of it with her antennæ. After finding a suitable spot her abdomen was raised until nearly vertical and then the ovipositor swung down and was placed for insertion at a point directly between her front legs. The sheath was forced in on a slant by one continuous push. The sheath was then removed and the ovipositor was forced in by an up and down motion. During this movement she turned around half way and in a short time returned to her first position. After about three minutes her ovipositor was removed.

These records of oviposition have been given in detail on account of the extreme scarcity of accurate observations on the method of oviposition by parasites.

AN EASTERN CHILOSIA WITH HAIRY EYES.

(*Diptera, Syrphidæ.*)

By R. C. Shannon, *Bureau of Entomology.*

Chilosia primoveris, new species.

Male: Robust species; shining, dark metallic green. Eyes hairy; vertex with long light colored hairs with black ones intermixed; frontal triangle with long erect black hairs and a furrow running down the middle; first two antennal joints deep reddish brown, the third a shade lighter; arista concolorous with the third joint and with microscopic pubescence on basal third. Face with light colored hairs and very fine pubescence, the tubercle distinctly nearer the oral margin than to base of antennæ and projecting far beyond latter.

Dorsum of thorax with rather long and dense whitish pile and mesopleura with long black hairs; post-alar callosities with fine long black and whitish hairs in tufts; scutellum covered with long whitish pile like that on mesonotum and with a few coarser black or yellow ones on the margin.

Abdomen slightly narrower than thorax, shining dark metallic green, with rather thick white pile.

All the femora black, their tips brownish-yellow, tibiæ yellow, with broad black rings around the middle; tarsi on outer side more black than yellow, on under side largely yellow.

Wings tinted with yellow, their bases dull brown which merges into yellow as it spreads out over the wings. Spurious vein weak; last section of fourth vein with two angulations which have very short stumps at their apices; the second spur, which projects into the first posterior cell, sometimes obsolete, the part of the vein beyond this last broadly curved outward. Length: 6–8 mm.; wing 6–7.5 mm.

Female: Frons narrower than one eye, narrowing towards vortex, with a broad transverse depression a short distance above antennæ and a weak longitudinal groove running from ocelli to the depression; frons clothed with light yellow erect pile which is longer in the ocellar region. Facial tubercle more prominent than in the male.

Mesonotum with some coarser hairs scattered through the light pile. Mesopleuræ with light pile.

Abdomen broader than thorax and with shorter pile than in the male. Last section of fourth vein with only slight trace of the second angulation, and rarely with trace of stump. Length 5–7 mm.; wing 5–7 mm.

Type locality: Plummers Island, Md. (Male type, April 16, female allotype April 25, 1915, R. C. S. coll.)

Type Cat. No. 19786, U. S. N. M.

Described from 45 specimens; paratypes from Plummers Island, Md. opposite Plummers Island, Cabin John and Great Falls, Md.; Dead Run, Fairfax Co., Va., April 7–25. (R. C. Shannon, J. C. Crawford, and W. L. McAtee, collectors).

This species runs to *C. petulca* in the table in Williston's Synopsis of the North American Syrphidæ. In comparison with the type of that species it is smaller, more robust, and darker shining metallic green. The arista of *petulca* is longer and with distinct pubescence to the tip; all three antennal joints are more yellow; the frons is yellow at base of antennæ. The body pubescence of *petulca* is very short and thinly scattered, the hairs on the scutellar margin stronger, shorter and black. The wings of *petulca* are comparatively longer; the last section of the fourth vein is much nearer the wing margin and runs nearly parallel with it. Its legs are of a more uniform color.

Actual date of publication, September 18, 1915.

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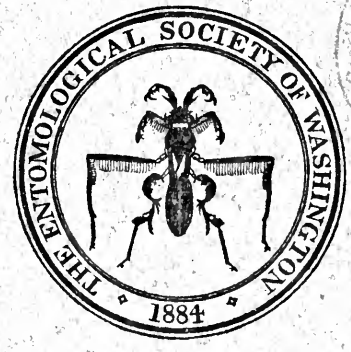

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PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF WASHINGTON

VOL. XVII 1915 No. 4

TWO HUNDRED AND EIGHTY-SEVENTH MEETING,
JUNE 3, 1915.

The 287th regular meeting of the Society was entertained by the Executive Committee at Saengerbund Hall, June 3, 1915. The following were present: Messrs. Barber, Böving, Caudell, Craighead, Crawford, DeGryse, Ely, Greene, Hall, Heinrich, Hood, Jackson, Knab, McIndoo, Middleton, Quaintance, Sanford, Schwarz, Shannon, Snyder, Strauss, Turner, members, and Mr. R. M. Garner, visitor.

The following papers were presented:

A NEW SPECIES OF CEPHENOMYIA FROM THE UNITED STATES.

(*Diptera; Œstrida*)

BY W. D. HUNTER.

In November, 1910, the late F. C. Pratt obtained a number of œstrid larvæ from the nasal passages of a deer (*Odocoileus virginianus texanus*) which was shot in the vicinity of Sabinal, Texas. By exercising extreme care Mr. Pratt succeeded in rearing two adults, a male and a female. In addition to the adults the writer has in his possession three puparia and five larvæ from the same source. The species has been found to be new and is described herewith.[1]

The only American species described under the genus *Cephenomyia* is *phobifer* Clark. As has been pointed out by Brauer this

[1] On first examination it was thought to be a European form and was referred to as such by the writer, see Proc. Ent. Soc. Washington, XIII, p. 88.

form, in all probability, does not belong to the genus *Cephenomyia*. At any rate Clark's description and the notes by Brauer show that it is entirely distinct from the form described in this paper.

Brauer[1] described a larval *Cephenomyia* obtained from *Cervus macrotis* in North America (not named in body of work but referred to as *C. macrotis* in index) and also recorded[2] the larva of *Cephenomyia ulrichii* Brauer from an American elk. Both of these forms are quite distinct from our species. Brauer also listed *Cephenomyia* sp. from "Durango."[3] The remaining American records of *Cephenomyia* are two notes in Insect Life, concerning the finding of larvæ in hogs in Virginia[4] and in man and deer in California.[5] The California specimens from the deer have been examined by the writer. They appear to be the same as the form described in this paper. The specimens from man are immature and cannot be determined.

Cephenomyia pratti n. sp.

Male. Ground color everywhere shining black. Pile of body light yellowish white except a few hairs between the antennæ and the eye margins, a broad band extending across the dorsum of the thorax, and the first three abdominal segments which have black pile. The pile of the legs is black except a white tuft at the base of the inner side of all the femora. Length 13 mm.

Female. Ground color shining black as in male, no pulverulence. Pile of head light yellowish white except between the base of the antennæ and the eyes. Pile of thorax and scutellum whitish except for a broad black transverse band between the bases of the wings. This band is interrupted in the middle by yellowish hairs. Pile of first three abdominal segments bright ferrugineous, of remainder whitish. Pile of legs black, except white tufts at bases of inside of all femora.

Eye margins converging toward vertex. Antennæ black, arista dark brown. Wings black at extreme base, otherwise hyaline, veins brown. Venation typical for genus. Tegulæ whitish, very narrow margin brown. Legs black, posterior femora and tibiæ slightly brownish. Claws black. Pulvilli whitish. Length 13 mm.

Described from two specimens, Sabinal, Texas, November and December.

Host: *Cervus virginianus texanus*.

Type: Cat. No. 19966, U. S. National Museum.

The name is in honor of the late F. C. Pratt.

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[1] Monographs der Oestriden, pp. 211–212.
[2] L. c., p. 202.
[3] Die zweiflügler des kais. Mus. Wien. III, p. 82, 1883.
[4] III, p. 151.
[5] II, p. 116.

The affinities of this species as shown by the adults and immature stages are with *C. ulrichii* Brauer. It differs, however, in not having the eye margins parallel above in the female, in not having interrupted transverse band of yellow pile on the abdomen and in having anterior femora with white hairs on the inner side at the base. It is also considerably smaller in size.

Larva: Third stage. Differs from its nearest relative *C. ulrichii* in having spines on segments 3–4 large and subequal.

Length 26–39 mm. Color yellowish brown, each segment with circular black spots, more numerous on posterior segments. Mouth-hooks arcuate but not curved backwards.

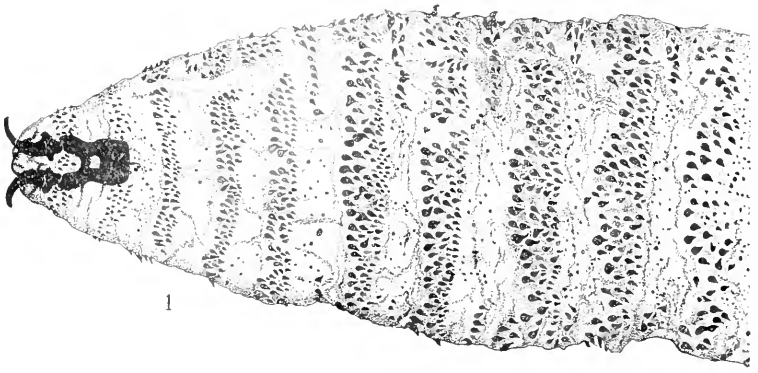
Upper side. Spines large, black, numerous, all those on segments 2–3 nearly equal in size, further described as follows: head segment (seen from in front), three irregular rows, those of the first row larger; first segment none; second segment two to three irregular rows subequal; third segment, three to four irregular rows, those of first rows equal in size, in third row somewhat smaller; fourth segment, four rows, subequal, three isolated spines on lateral posterior margin; fifth segment, four rows anteriorly and four to eight in lateral posterior rows; sixth segment, five anterior rows, spines of last rows considerably smaller, six to eight in posterior lateral rows; seventh segment, five to six rows smaller toward rear, lateral posterior rows of six to eight spines; eighth segment, seven irregular rows, the first having the spines well separated, about six spines on posterior lateral margins; ninth segment, four rows, well separated, two to three on posterior lateral margins; tenth segment with only two to three spines on each side near anterior margin, and two entire rows on posterior declivity.

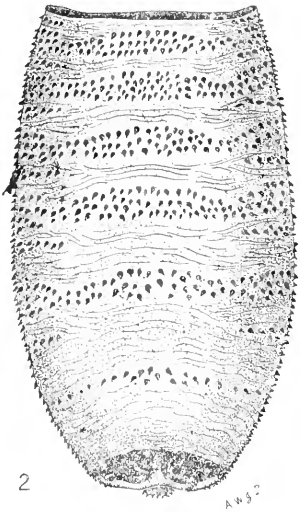
Lower side. Second segment, two rows in middle, three on sides; third segment, four rows, subequal; fourth segment five rows, those of first two somewhat larger; fifth segment, six to seven rows, those of first two rows considerably larger; sixth segment, seven rows; seventh segment, seven rows; eighth segment, six rows more sparsely placed than on preceding segments; ninth segment, like eighth; tenth segment, four to five rows, isolated; eleventh segment, on anterior margin at middle, three short rows, one on sides, under posterior declivity, one transverse and three semi-circular rows.

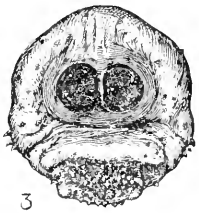
Posterior stigma large, interior margins parallel, no indications of radiating lines, black, with three to four small shining tubercles near lateral margins.

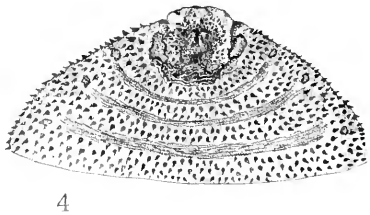
Described from five specimens.

Puparium: Above. Second segment, three rows of spines; third to eighth segments, three to four rows; ninth segment, one row in middle, two on each side; tenth segment, one row interrupted in middle. Dried specimens show numerous fine transverse ridges which are not evident in alcoholic specimens. Black. Length 20 mm., width 7 mm.









Explanation of Plate XVI.

Cephonomyia pratti Hunter.

Fig. 1. Skin of dorsum of larva in third stage, cleared and mounted in balsam.

Fig. 2. Puparium.

Fig. 3. Posterior stigmata of larva.

Fig. 4. Larva, ventral view of anterior portion.

Described from three specimens.

The writer is indebted to Messrs. F. Knab and N. Banks for advice regarding the specimens used in the preparation of this paper

NOTE

Since the manuscript of this article was submitted for printing an important paper by Dr. J. M. Aldrich has appeared: The Deer Bot-Flies (genus *Cephenomyia* Latr.), J. N. Y. Ent. Soc. XXIII, pp. 145–150, 1 pl. Dr. Aldrich describes a new species under the name *abdominalis*. This species, however, is quite distinct from *pratti* in the striking difference in the color of the abdominal pile and in the dark anterior wing margins, which Dr. Aldrich informs the writer are even darker than this illustration shows, in fact quite blackish from the anterior cross vein forward.

SOME MODIFICATIONS OF THE HYPOPHARYNX IN LEPIDOPTEROUS LARVÆ.[1]

By J. J. DeGryse.

Branch of Forest Insects, U. S. Bureau of Entomology.

In his morphological study on the mouthparts of Crustaceans and Insects,[2] published in 1893, H. J. Hansen contends that the paired appendages existing on the sides of the hypopharynx

[1] Since writing this paper I had the opportunity of again examining Lyonet's Traité anatomique de la Chenille qui ronge le bois de Saule (The Hague, 1762). His figures of the labium and hypopharynx are most interesting especially from the standpoint of the internal anatomy of the lower lip. He refers to the so-called maxillulæ as "Rebords de la Lèvre inférieure." In Chap. IV, p. 62, he gives his theory of the function of these organs. In spite of the imperfection of his instruments, Lyonet's dissections are remarkably accurate. The shape of the chitinous blades or spines was no doubt beyond the power of his microscope. As to the arrangement of the muscles, I think there is a slight confusion in the drawing (Lyonet, Pl. XVII, fig. 25), though in the text (Chap. XVII page 563), the author supposes the existence of other muscles, besides those figured in Pl. XVII, by so doing he partly solves our difficulty. I have not studied the particular species described by the master, but from a comparison with other lepidopterous larvæ, it is probable that his muscle *I* should consist of two different muscles *I'* and *I''*. *I'* is attached dorsally to the mental arm and ventrally to the threadpress on the salvary glands. *I''* is attached dorsally to the same press and ventrally to the mentum. Each of these muscles is provided with a separate embranchment *C'* and *C''* of the trachea indicated by the letter *C* in Lyonet's drawing. (See pl. 19, fig. 7).

[2] "Zur Morphologie der Gliedmassen und Mundtheile bei Crustaceen und Insekten." Zool. Anz. XVI, 1893, pp. 193–8 and 201–212.

in Thysanura and Collembola are in reality second maxillæ, homologous with the first maxillæ of Crustacea. Older authors, considering these organs as part of either the hypopharynx or the labium, called them "paraglossæ." Hansen rejects this term and substitutes for it the term "maxillulæ" as a more appropriate name. Since the publication of Hansen's paper, several authors have shown the existence of these so-called maxillulæ or of apparently homologous organs in various orders of insects.[1]

Of late, the most interesting contributions on the subject are two papers, one by G. H. Carpenter and Mabel McDowell: "The Mouthparts of Some Beetle-larvae" (Quart. Journ. Micr. Sc. LVII, 1912, pp. 373–96), the other by G. H. Carpenter: "The Presence of Maxillulæ in Beetle-larvæ" (Transact. 2d. Internat. Congr. of Entom.)

The existence of maxillulæ in Lepidoptera was first recognized by Busck and Böving. Their description of this organ is found in their joint paper: "On *Mnemonica auricyanea*" (Proc. Ent. Soc. Wash. XVI, 1914, no. 4, 151–63). Dr. Böving first discovered the maxillulæ in the imago of *Mnemonica* and later pointed out in my drawings, what he considered to be corresponding structures in the larva. In our paper on *Acrocercops strigifinitella* (Proc. Ent. Soc. Wash. XVII, 1915, no. 1, pp. 10, pl. VI, fig. 1, pl. VII, fig. 3) Mr. Heinrich and the writer have described and figured the maxillulæ in the larva of that species. I know of no other direct reference to this organ in the literature on Lepidoptera.[2]

Independently from the intricate question of their true nature, these organs invite our special attention on account of their interesting modifications. The object of this paper is to describe a few of the most extreme types as they appear in the lepidopterous larvæ. The material examined for this study is scattered over some twenty widely divergent families. Only a few forms are described in this paper as representative of the most remarkable cases met in the course of researches.

The maxillulæ, or paraglossæ or superlinguæ[3] are situated on the lateral edge of the hypopharynx. In the lepidopterous larvæ, they essentially present the appearance of protuding fleshy

[1] For Bibliography cfr. G. H. Carpenter: "The Presence of Maxillulæ in Beetle-larvæ." Transact. 2d. Internat. Congr. of Entom, pp. 208–215, in appendix of the article.

[2] Dampf in his paper: "Zur Kenntniss gehäusetragender Lepidopteren larven" (Zool. Jahrb. suppl. 12 H. 13, 1910.) gives a rough figure of these appendages in *Enmeta* sp. and considers them as belonging to the hypopharynx.

[3] The term "superlinguæ" is used by Folsom in his text-book on Entomology (pp. 39–40), 1906.

lobes, covering the floor of the buccal cavity wholly or in part only, as the case may be. These lobes are generally clothed with flexible lashes, with hairs or with rows of strong spines. They attain various proportions in all directions; so far, I have found that relatively to the size of the hypopharynx they attain their greatest dimensions in some of the microlepidoptera. In many instances the lobes are also furnished with chitinous blades, these again, are subject to the most extreme modifications both as to their general shape and to their location on the lobes.

Although really distinct from the hypopharynx the chitinous projections of the mentum[1] marking the exterior of attachment of the maxillulæ, should be mentioned in connection with these organs, as they are, in some cases at least, subject to modifications of real interest. In *Mnemonica auricyanea* Wlsghm., arms from the mentum enter the mouth cavity and are fused at the base of the hypopharynx, forming a complete ring, with a conspicuous plate at the point of fusion. The lobes of the maxillulæ originate at the forward edge of this plate. They appear as membranous flaps, clothed on their inner edge with a row of long cilia-like hairs. The appendicular nature of these lobes can readily be recognized, as they can be laid to one side and often will take this position under the mere pressure of the cover-glass of the microscopic slide. Slightly forward of the above mentioned plate, we find on each side of the hypopharynx a row of four or five minute teeth. These are a part of the maxillulæ, but not the whole organ, as was inferred by Busck and Böving in their paper on this species. (For figure, cfr. Busck and Böving "On *M. auricyanea*," loc. cit. pl. XI, fig. 8).

The mouth-cavity of *Ectodemia heinrichi* Busck, presents a totally different aspect from that of *Mnemonica*. Here, the arms of the mentum suggest the shape of a boot. They are very slender and reach only a short distance over the lateral edge of the hypopharynx. From the extremities of these arms arise two fleshy lateral lobes, somewhat corrugated in appearance and covered with filaments and spines. They are partly hidden by the blades. These consist of a set of enormously developed plates, they overlap and cover the entire floor of the basal part of the mouth-opening (cfr. pl 18, fig. 5). In a species of *Gracilaria* collected on *Alnus* by Prof. Charles R. Ely, we find what might be called a typical form of the modifications studied in this paper.

[1] The term "Mentum" is applied sensu Dampf: "Zur Kenntniss gehäusetragender lepidopteren larven (loc. cit). It applies to the part designated as stipes labii in our paper "On *Acrocercops strigifinitella*" (Proc. Ent. Soc. Wash., loc. cit.); cfr. also Busck and Boving "On *Mnemonica auricyanea*" (Proc. Ent. Soc. Wash., loc. cit.).

The three elements are developed to fairly equal proportions. The arms of the mentum approach in general outline those of *Ectædemia*, but they are wider and the foot of the boot becomes much larger. To each of these arms is connected a fleshy lobe with the usual filaments and hairs along the anterior portion and covered with bristly spines, arranged in parallel rows towards the base. The lobes are attached to the upper edge of the hypopharynx by means of transparent chitinous rods. The blades projecting from and above these lobes are arranged in a longitudinal row. The three front blades are short and broad, the others are slender and finger-like, all arising from a common, narrow base (cfr. pl. 17, fig. 3).

The arms of the mentum in *Acrocercops strigifinitella* Clemens, are very thin bands of chitin, presenting a ragged appearance at their extremities. The lobes are developed to vast proportions and a pronounced chitinization marks their line of junction to the hypopharynx. The interior surface is finely striated, the exterior being covered with filaments. The blades consist of a row of translucent plates. They have moved to the apex of the lobes. On examining these blades under oil-immersion it was found that the two lower ones are placed so closely to the arms of the mentum as to appear attached to these processes (cfr. pl. 17, fig. 4).

In an undetermined sesiid larva taken from the roots of cottonwood, we find the arms of the mentum quite long but projecting only slightly over the hypopharynx. The lobes are reduced and covered with spines. The blades are very similar in shape and in texture to those in *Acrocercops strigifinitella*, but their line of attachment corresponds better to that in the other gracilariid larva described above (cfr. pl. 18, fig. 6).

Lagoa crispata, *Papaipema nitela* in the macro-lepidoptera and *Coleophora veroniacella* in the micro-lepidoptera are representative of the most commonly occurring type, with well defined arms, fleshy lobes covered with spines but devoid of all traces of blades (cfr. pl. 17, figs. 1 and 2 and text fig. 1).

From their location in the buccal cavity we naturally assume that the function of the organs described above is relative to the feeding of the caterpillar. Most probably they facilitate the entrance of food into the alimentary canal, maybe they are also, in a certain measure, auxiliary to the mandibles in the mastication of the food particles. In none of the specimens have I found muscles belonging to the maxillulæ themselves (viz. lobes or plates).

It would appear then, that their movements are controlled by the muscles attached to the mentum and its arms. In this

event, they are merely secondary to the general functions of the hypopharynx. The main movements of the latter organ are produced by the mental-tentorial muscles *B* (pl. 19, fig. 7) and the mental-zygomatic muscles *A*. These, when acting simultaneously, cause the retraction of the entire labium and acting independently cause the elevation and depression of the same.

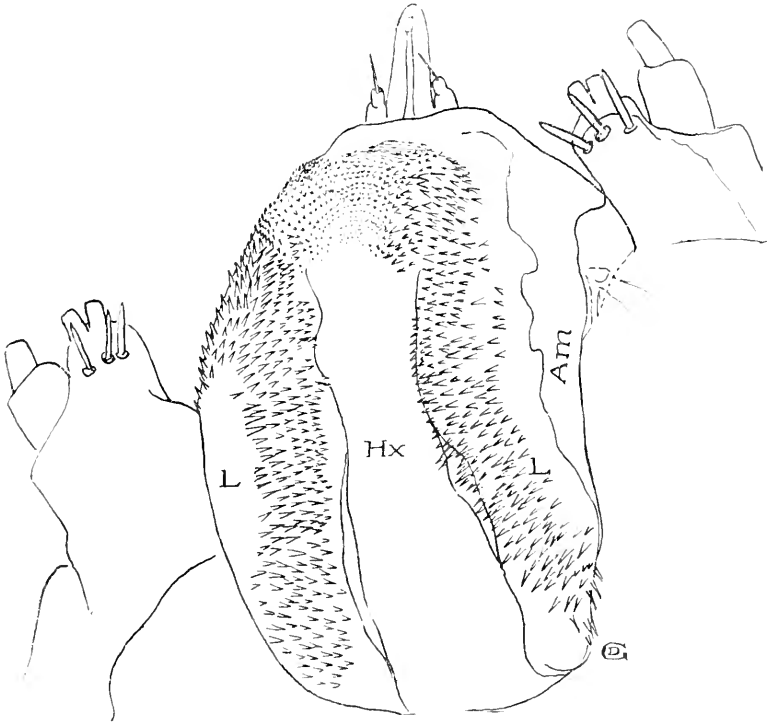


Fig. 1. *Papaipema nitela* Guenee.

Inasmuch as the mental arms are often very thinly chitinized and hence more or less elastic, it is not improbable that a slight inward and downward movement be imparted to the maxillulæ by the play of the muscles *I'* and *I''*, although these are primarily intended for dilation of the threadpress (pl. 19, fig. 8) and various movements of the spinneret *S* (pl. 19, fig. 7).

Many questions readily arise in the mind concerning these organs or their parts. The answer to such however must be reserved until more extensive and more minute studies have been completed. Above all things what seems to be of no little significance is that, so far, we have found a striking conformity of type within the genus and at the same time most widely divergent forms within the same family.

The writer is greatly indebted to both Dr. Böving and Mr. Heinrich for many valuable suggestions and especially to the latter for material for study.

Explanation of Plates.

Plate XVII.

Fig. 1. *Lagoa crispata* Pack.

Fig. 2. *Coleophora veroniæella* Chambers.

Fig. 3. *Gracilaria* sp.

Plate XVIII.

Fig. 4. *Acrocercops strigifinitella* Clemens.

Fig. 5. *Ectædemia heinrichi* Busck.

Fig. 6. Sesiid larva.

Hx = Hypopharynx; *L* = Fleshy lobes; *B* = Blades; *Am* = Arms of mentum.

Plate XIX. *Telea polyphemus*, Cramer. Anatomy of lower lip.

Fig. 7. Side view of labium and hypopharynx.

A = Mental-zygomatic muscle; *B* = Mental-tentorial muscle; *Am* = Arm of mentum; *L* = Fleshy lobe; *S* = Spinneret; *C*, *C'*, *C''* = Tracheæ; *Sd* = Salivary ducts; *I'*, *I''* = Dilator muscles of the threadpress; *G* = Filippi's glands.

Fig. 8. Threadpress.

I', and *I''* = A few of the muscle attachments.

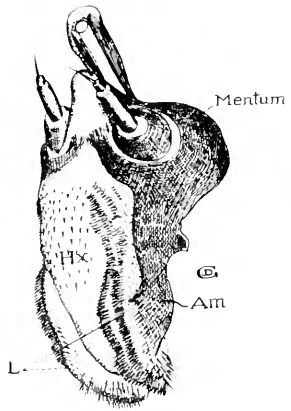


FIG 1

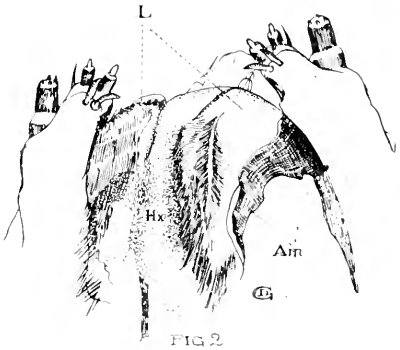


FIG 2

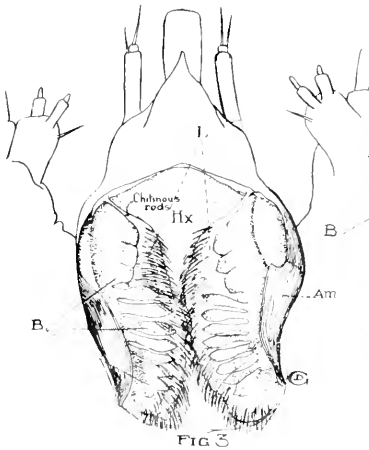


FIG 3

FIG 4

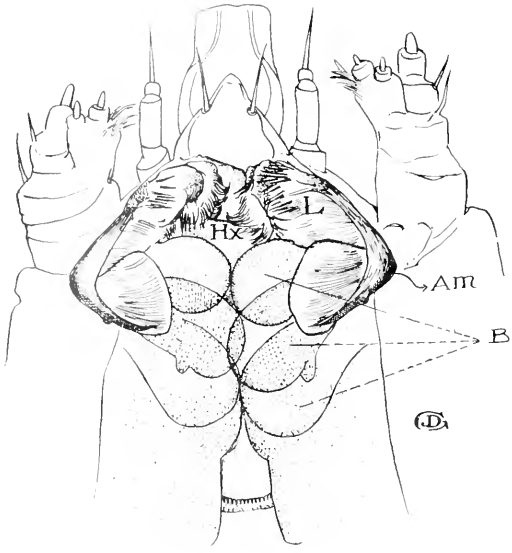


FIG. 5

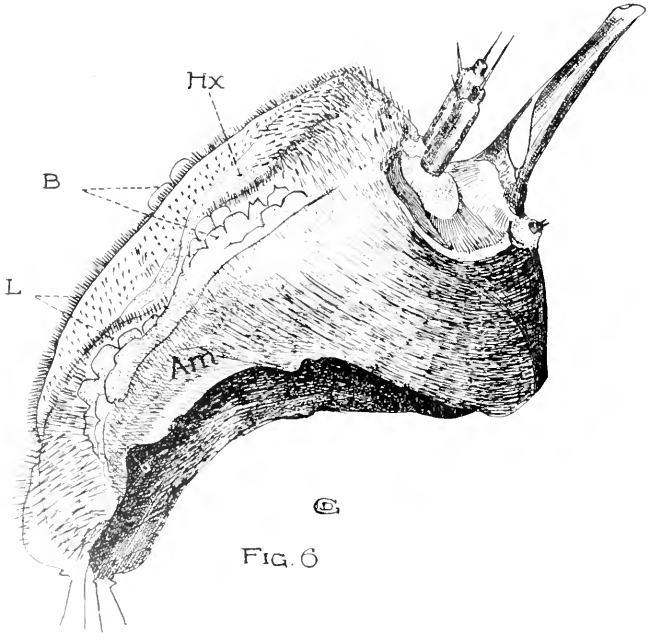


FIG. 6

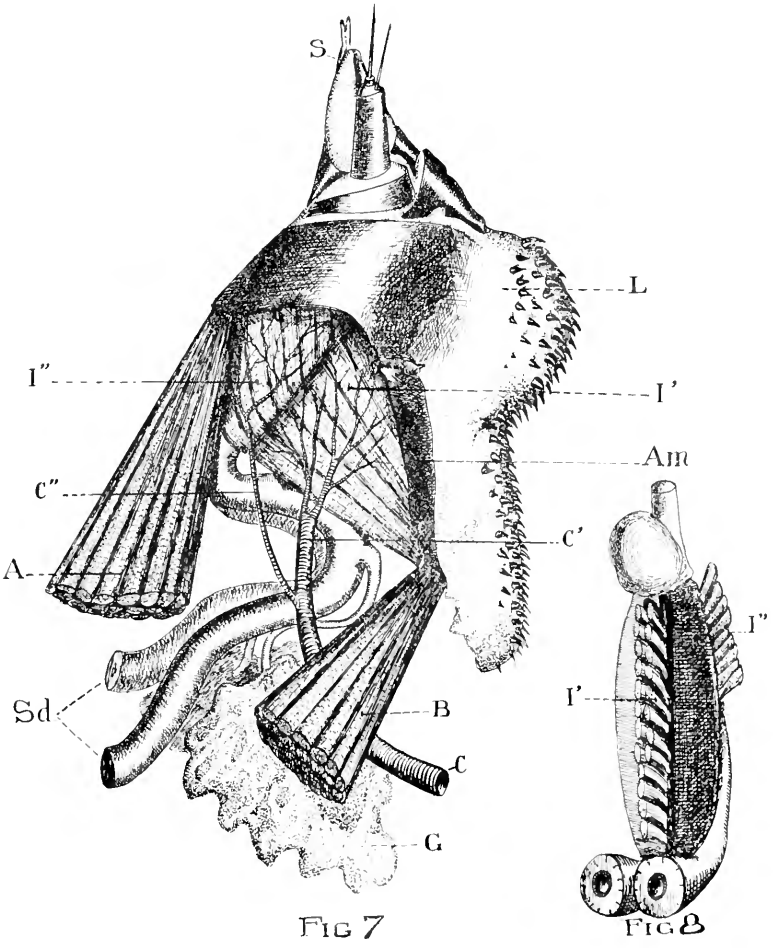


FIG 7 FIG 8

In commenting on this paper Mr. Heinrich stated that in addition to the interesting morphological questions involved, the maxillulæ promised to be of prime taxonomic importance as indicating generic differences in the larvæ of the specialized micro groups at least. From the material examined it would seem that there are two distinctive types of maxillulæ, a simplified type common to the Macros and pyraloid groups and a specialized type common to the Micros, as defined by Mr. Busck. It is also interesting to note that while these organs vary according to the manner of feeding, as could be expected, the two types are maintained under the same biological conditions.

NOTES ON THE HABITS AND ANATOMY OF HORISTONOTUS UHLERII HORN.

(*Coleoptera; Elateridæ.*)

By J. A. Hyslop, *Bureau of Entomology.*

The larvæ of the tribe Cardiophorini in the Elateridæ have long been recognized. Schiödte, Perris and Henriksen have all given good descriptions and several good figures have been produced of the larvæ of the genus *Cardiophorus*. Notable among these figures is the excellent one of *Cardiophorus asselus* by Schiödte.[1] So far as I am aware, the figure of *Horistonotus uhlerii* by Mr. W. R. Walton, in the recent Department Bulletin[2] on wireworms is the first figure of any other genus in this tribe. At the time this figure was prepared only preserved material was at hand. This spring through the kindness of Mr. E. H. Gibson, I have received several living larvæ of this insect from Charleston, Missouri.

The larva of *Horistonotus uhlerii*, as has already been recorded, lives in sandy situations where it feeds on living vegetable matter. The rapidity with which the temperature and humidity of its habitat follows the atmospheric changes is extreme when compared with more impervious soils. The sand rapidly dries out to a considerable depth in dry weather and becomes cold correspondingly abruptly with a fall in atmospheric temperature, the lag being considerably reduced by the open nature of the soil. Elaterid larvæ, as we have had very forcibly demonstrated in our rearing experiments with these insects, are extremely

[1] Meta. Eleuth. Obs., 1871.
[2] Bull. 156, U. S. Dept. Agric., 1915, fig. 3.

sensitive to rapid changes in temperature and with but few exceptions cannot stand desiccation in the slightest degree. The body structure and activities of *H. uhlerii* are admirably adapted to overcome these adverse circumstances of environment, not by resisting the elements but by making it possible for these animals to change their position in the soil with the variations of climatic conditions so as to always be in a stratum where the environment is compatable with their development or at least their existence. As the sand dries out, or as the cold weather approaches they rapidly burrow downward, conversely as moisture rapidly saturates their porous nidus or the temperature rises they move as rapidly upwards, and may even make daily upward and downward migrations to accommodate themselves to the ephemeral changes in temperature and humidity. The nature of their habitat makes the construction of permanent burrows impossible, hence the remarkable development of their bodies. The extremely broad palmate and digitate retractile anal lobes, form a backwardly directed pushing organ wonderfully designed to prevent any backward movement of the abdomen when burrowing in the loose sand, the spined caudal appendage on the ninth abdominal segment also assisting in this function. When moving foreward the larva contracts the abdomen by completely invaginating the anterior area of each abdominal segment within the posterior area of the preceding segment; the anal lobes are retracted as are also the lateral and ventral ambulatory papillæ, thus offering no resistance; the anterior part of the body is prevented from moving backward by the broad, spine beset surface of the tibiæ and tarsi of the legs, which may be assisted by the mandibles. The lateral papillæ and anal lobes are now excerted and the body starts to exert a pressure foreward by the longitudinal expansion of the segments, the mandibles work rapidly in an absolutely lateral plane, their concave outer surface pressing back the sand on each side much as do the short mannæ of the mole, the mouthparts with their stout brushes probably also assist in clearing the way. These brushes undoubtedly prevent sand from being forced into the buccal cavity. When on a hard surface the larva moves the head and mandibles very rapidly, at the same time tremulously jerking the fore part of the body from side to side. The legs are also kept rapidly moving. When placed on moist blotting paper the head is applied to the paper, and the stout mandibles soon tear an opening through the fibers of the paper, the tearing action is confined to the outward thrust of the mandibles, the stout teeth on the inner surface not coming into play and probably only being used to lacerate plant tissue when feeding. When moving backward the ventral papillæ play the most important part. These are directed forward and

when the hold of the mandibles and legs is released and the body contracted they prevent the segment slipping forward. On a hard surface the caudal lobe of the ninth abdominal segment also assists in backward motion. In this case it is bent downward and acts as a hook shaped anchor.

The following technical description will more fully describe the details of these structures and also serve as a means of determining these larvæ:

Horistonotus uhlerii Horn.

Larva. (pl. 21, fig. *a*). Elongate, slender and membranous, twenty-seven times as long as wide; color cream white, head ferruginous yellow, prothorax yellow, mandibles brownish yellow to almost black, spines on legs brownish yellow.

Head (pl. 20, figs. *a*, *b*) elongate cylindrical, length exclusive of mandibles, twice diameter, sides subparallel, very highly polished. Front very narrow, sides almost parallel, diameter at middle about one-sixth diameter of head, extending to basal sixth of head, anteriorly dilated to attachment of clypeus; bears a pair of fine hairs near point where it is constricted. Clypeus quadrate, a little longer than broad, anterior angles membranous, anterior margin densely fringed with brush of fine hairs, emarginate and armed at middle with a highly chitinized bidentate prong; the dorsum bears four pair of short erect hairs. Antennæ slightly received in fossæ on dorsal surface of mandibles, very large, almost one-third length of head exclusive of mandibles; first joint clavate and but little longer than broad; second joint depressed, cylindrical, wider at distal extremity which is obliquely truncate, truncate surface bearing on inner part the very slender and rather short third joint and the accessory appendage, which latter is white and conical; the third joint is about as long as the first joint, cylindrical and three times as long as broad, it is slightly curved and directed at right angles to the long axis of the second joint. Mandibles (pl. 20, figs. *d*, *e*, *f*, *g*) are two-thirds the length of the head, biramous, and multidentate; the outer surface (pl. 20, fig. *e*) is slightly concave and each ramus bears two longitudinal carinæ; the inner surface (pl. 20, fig. *f*) of the dorsal ramus bears three stout acute teeth and two smaller teeth, the latter situated on each side of the lowest tooth; the ventral ramus is unarmed, at the base of the mandible on the inner surface is a broad oval molar area and a row of bristles continue the armature of the upper ramus. The submentum (pl. 20, figs. *a*, *c*) is almost obliterated, by the highly developed maxillary stipes, it is broadened at the anterior half but almost cut off from the mentum by the maxillary stipes which suddenly converge anteriorly, the submentum bears four hairs on its anterior part and a single pair at its posterior extremity; the mentum is elongate and clavate, and is adorned with a pair of median hairs near its distal end; the labial palpi are about half as long as the mentum, the first joint is twice as long as broad, the second is conical and one-third as long as broad; the maxil-

lary stipes are elongate and armed with nine stout spines on the lateral margins; the maxillary palpi are very stout and two-thirds as long as the stipes, the first joint is one and one-half times as long as broad, slightly clavate cylindrical, the second joint is one-quarter longer than broad, the third as long as broad and the fourth twice as long as broad and only half as wide as the third; the galea are two jointed, the first joint elongate and thickly beset with brushes of complex hairs, the second joint is clavate and bears four stout spines at its distal end; a second brush of hairs arises below the attachment of the galea and a third brush is situated on the under surface of the clypeus.

The first thoracic segment is nearly cylindrical and almost as long as the head exclusive of the mandibles, the second and third are subequal and about three-quarters as long as the first; the legs (pl. 21, fig. *d*) are very long and quite stout, the coxæ are as long as the femora and tibiæ united, and serve to receive these two joints when in repose; inner edge of coxæ bears a few long hairs; femora clavate and two-thirds as long as coxæ, tibia triangular, armed with three blunt stout spines near anterior margin, tarsus beset with one large scoop-shaped spine near the distal end, surrounded by four blunt spines and bearing three additional blunt spines along its inner side.

Abdomen with ten visible segments, segments two to seven are distinctly divided transversely into three distinct areas each, the anterior area of one segment being truncate conical and capable of being invaginated into the posterior area of the preceding segment when contracted, the middle area of each segment (pl. 21, fig. *b*) is globose, bears the ambulatory papillæ and the spiracles. Each segment bears two pair of ambulatory papillæ, a lateral pair anterior to the spiracles and a ventral pair near the anterior margin; each papillus is bilobed, and retractile; the spiracles are very obscure but of the typical biforian type; the tergite of each abdominal segment is marked by a median impressed line and a pair of shallow lateral grooves, the ventron of the middle area of each segment is divided into two parts by a median sulcus. The ninth abdominal segment (pl. 21, figs. *c*, *e*) is thimble-shaped and about as long as the middle section of the other abdominal segments; it bears at its extremity a rounded point which is armed with radially arranged stout spines. The tenth segment is concealed from above by the ninth, near the middle of the ventral side of which it arises, it is depressed cylindrical and directed obliquely ventrad; the anus is terminal and the anal lobes are arranged as follows:

The two lateral lobes are quadri-digitate and longer than the tenth segment, the ventral lobe is short and bidigitate, all these lobes are retractile.

The larva of *Horistonotus uhlerii* differs from that of *Cardiophorus asselus* and probably from all other species of this last genus, in the absence of ocelli. Schiödte has figured a large prominent ocellus at the base of each antenna. These ocelli are very clearly seen in Schiödte's specimens, which, through the kindness

of Dr. Böving who assisted me in many ways in this investigation, I have been able to examine. They are quite absent from *H. uhlerii*.

The mandibles of *C. asselus* have a pair of stout teeth on the distal end, and two teeth on the inner face of each dorsal ramus, while in *H. uhlerii* the distal end of this ramus is rounded and the inner face bears three stout teeth with two smaller accessory teeth. The clypeus of *C. asselus* bears seven pair of dorsal hairs, while that of *H. uhlerii*, bears but four pair. The tibia of *C. asselus* is armed with two terminal spines, that of *H. uhlerii* with three, the tarsus of the former with one basal spine while the latter has three.

Schiödte in his classification says that the spiracles are tubular, this conclusion being probably drawn from their proximity to the lateral ambulatory papillæ, which are retractile; the spiracles are however of the true biforian type and are situated a little behind the papillæ, not on them.

I agree with Henriksen in believing that Schiödte was wrong in classifying this tribe with his subfamily Agrypninæ. He based his conclusions on a mistaken interpretation of the anal lobes. In his preserved specimen these are partly retracted so that they give the appearance of a membranous anal hook, which character he quite correctly used to limit his group Agrypninæ. I differ from Henriksen however, as he considers them in the subfamily Elaterinæ, in which subfamily the adults have always been placed. I believe the Cardiophorini of authors should at least be raised to equal rank with the other greater subfamilies of the Elateridæ (sensu stricto) and it may be eventually necessary to place this tribe in some higher ordinal catagory.

Explanation of Plates.

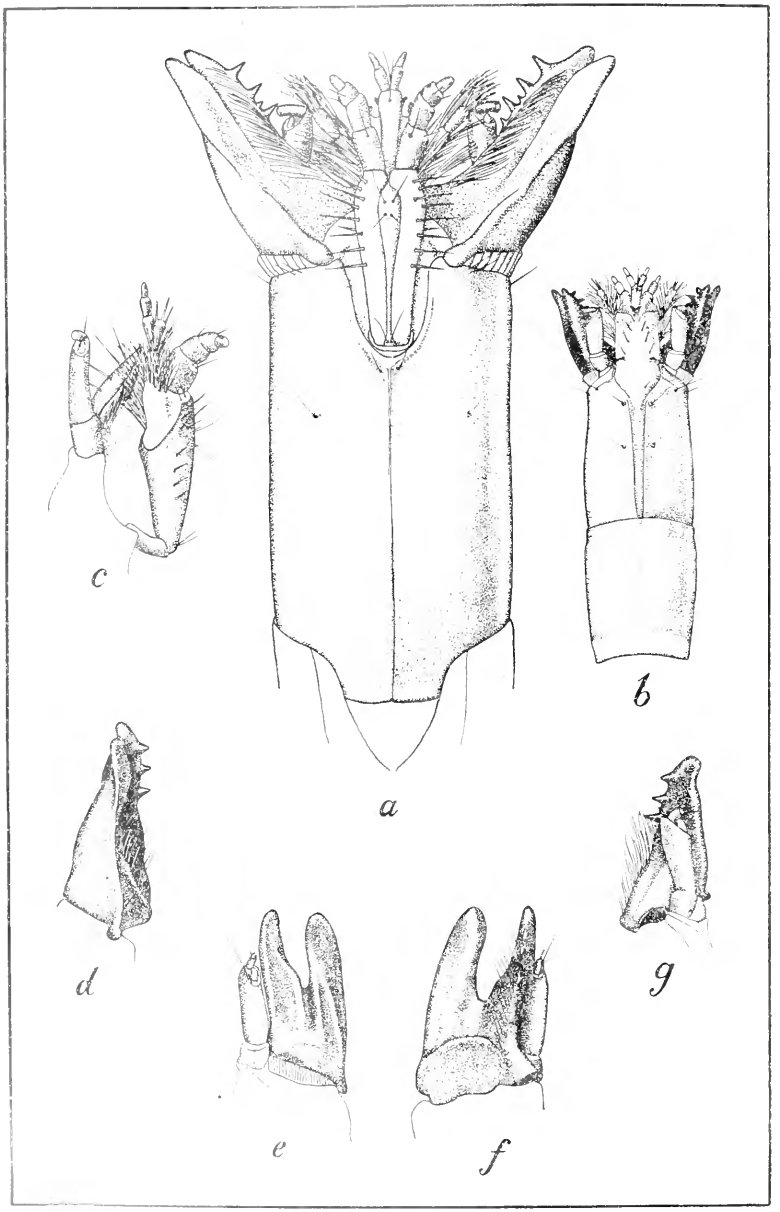
Horistonotus uhlerii Horn. (larva).

Plate XX.

Fig. a. Ventral aspect of head.
Fig. b. Dorsal aspect of head.
Fig. c. Lateral aspect of mouthparts, mandible removed.
Fig. d. Ventral aspect of right mandible.
Fig. e. Outer aspect of right mandible.
Fig. f. Inner aspect of right mandible.
Fig. g. Dorsal aspect of right mandible.

Plate XXI.

Fig. a. Dorsal aspect of larva.
Fig. b. Lateral aspect of middle part of fourth abdominal segment.
Fig. c. Lateral aspect of ninth and tenth abdominal segments.
Fig. d. Left mesothoracic leg.
Fig. e. Ventral aspect of eighth, ninth and tenth abdominal segments.


a
b
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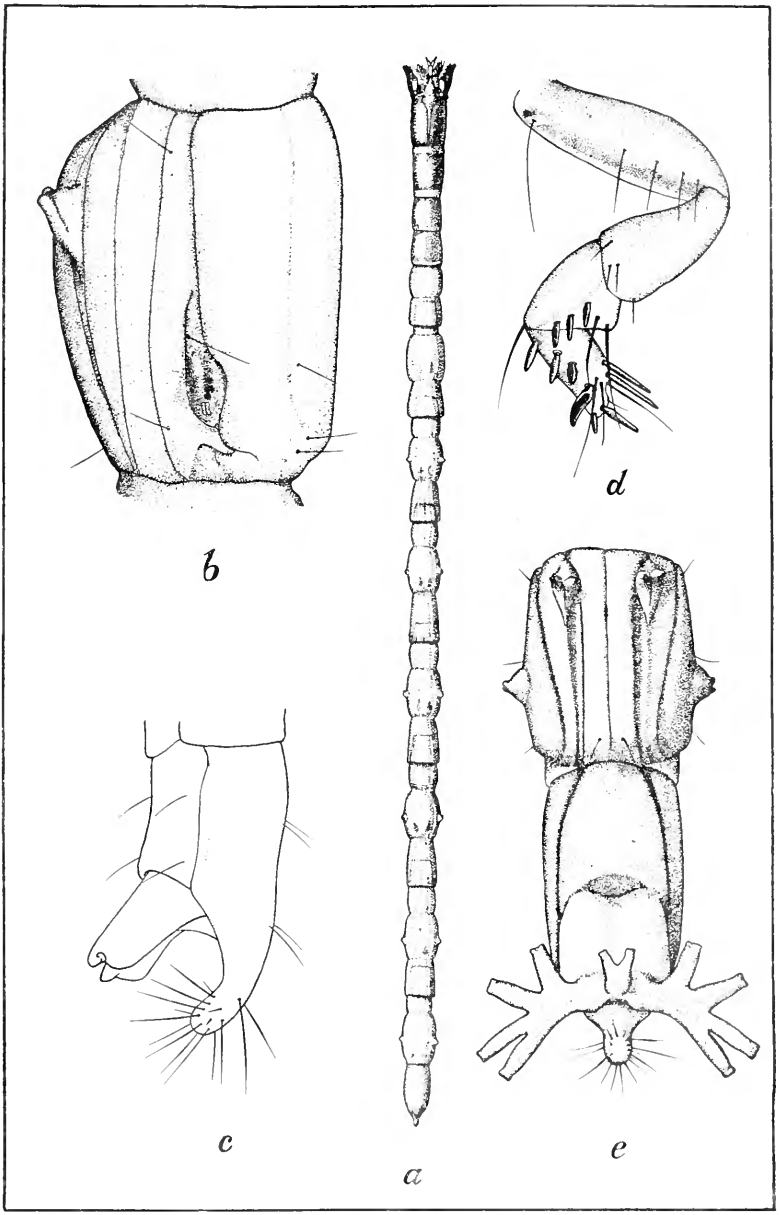
b
d
c
a
e

Under the heading of Notes and Exhibition of Specimens, the following were presented:

A NOTE IN REGARD TO TRICHODECTES HERMSI.

(*Mallophaga; Trichodectidæ*)

By Maurice C. Hall, *Bureau of Animal Industry.*

Kellogg and Nakayama have recently published in Psyche, v. 22, No. 2, April, 1915, a description of a new species of *Trichodectes* (*T. hermsi*), from the goat. The authors of this species say of *Trichodectes climax:* "It is the only *Trichodectes* until now found on the domestic goat." It seems safe to assume then that these writers follow Taschenberg in regarding *T. limbatus* and *T. capræ* as synonyms of *T. climax*. It seems, however, that they must have overlooked, at the time of publication, the case of *Trichodectes crassipes*, for they state in regard to *T. hermsi:* "It shows more of a resemblance, in shape and markings of head, and general appearance of body to *T. penicillatus* than to any other species of the genus, which resemblance, if it suggests any near relationship—it probably does not—is most extraordinary, as *penicillatus* has been recorded only from a kangaroo!"

The species *Trichodectes crassipes* was described by Rudow (1866) from the goat. Taschenberg (1882), on an examination of Rudow's material, stated it was identical with *T. penicillatus* from the kangaroo. Taschenberg states in comment that if one compares Rudow's and Piaget's figures he will regard this as quite impossible, since Rudow's figures are as inexact as his descriptions are noncommittal. It is interesting to note in this connection that Rudow's *T. crassipes* from the goat came from the Zoological Garden at Hamburg, and that Paiget's *T. penicillatus* from the kangaroo came from the Zoological Garden at Rotterdam. While one would be inclined to think under these circumstances that we were dealing with a habitual parasite of the kangaroo accidentally present on the goat, and assume that the parasites of the goat were well known, nevertheless the record of Kellogg and Nakayama suggests that there is, on the contrary, a rather widely distributed goat parasite which has been reported once as an accidental parasite of the kangaroo.

It would not be safe to say positively at this time that *T. hermsi* was identical with *T. penicillatus*, although a comparison of the figures and descriptions shows only minor differences, but the fact that the resemblance has been noted by the authors of *T. hermsi*, and that *T. penicillatus* has been reported from the goat and the kangaroo in the opinion of Taschenberg and of

Railliet, and that Kellogg and Nakayama have apparently overlooked or forgotten this fact, all argue for the likelihood that *T. hermsi* is a redescription of *T. penicillatus*.

MACROSIAGON FLAVIPENNIS IN COCOON OF BEMBEX SPINOLÆ.

(*Coleoptera, Rhipiphoridæ*)

By H. S. Barber, *Bureau of Entomology.*

A fully matured specimen of this parasitic beetle was found by Mr. J. B. Parker in the still solid cocoon of a wasp (*Bembex spinolæ*), in a sand pile at Brookland, D. C., June 26, 1914, which I believe is the first host record of this species. Two other host records of the genus in North America are known to the writer, Lugger 1884 (Psyche, vol. 4, p. 211) being quoted as saying that the larva of *Tiphia* is often parasitized by a (*Rhipiphorus*) *Macrosiagon* (which statement was commented upon by Riley, l. c., p. 224) and Wolcott 1914 (Journ. Econ. Ent., vol. 7, p. 387) alluding to the parasitism of *Tiphia* cocoons by (*Rhipiphorus*) *Macrosiagon pectinatus* Fabr., and perhaps another species, in Missouri and Illinois, the details of the life-history not being known.

A most interesting account of a European species of this genus, *Emmenadia flabellata* Fabr. (this name now appearing in the Reitter catalogue as a synonym of *Macrosiagon ferruginea* Fab.), was published by Chobaut 1891 (Ann. Soc. Ent. Fr., vol. 60, pp. 447–456) in which the rearing of this parasite from the larvæ of *Odynerus* is recorded, and also the oviposition and first stage larvæ or triungulinids are described. This last writer cites and comments upon the account by Chapman 1870 (Ann. and Mag. Nat. Hist., vol. VI, 4 ser., pp. 314–326, pl. XVI) and Murray 1870 (l.c., pp. 326–328) of the life-history of *Metœcus paradoxus* (*Rhipiphorus*), parasitic in the nests of *Vespa vulgaris*.

Two species of *Rhipiphorus* (*Myodites* of our catalogs) have been recorded by Le Conte 1880 (Monthly Proc. Ent. Soc. Acad. Nat. Sci. Philadelphia, Dec. 13, 1880, p. XXIII) as parasitic, one on *Augochlora pura* and the other on *Nomia nevadensis* Cresson. [The determination of this latter is wrong, the insect being *Nomia pattoni* Ckll.]. Melander and Brues 1903 (Biol. Bull., vol. 5, No. 1, p. 26) suggest the parasitism of (*Myodites*) *Rhipiphorus fasciatus* Say on *Halictus pruinosus* Robertson. Pierce 1904 (Nebr. Univ. Studies, vol. 4, No. 2, pp. 153–189) records the oviposition of (*Myodites*) *Rhipiphorus solidaginis* in the flowers of *Solidago*, the transmission of the triungulinids to sunflowers by many different species of bees, where the real host,

Epinomia triungulifera Vachal, is attacked and carries them to its colonies.

Mr. Schwarz 1909 (Proc. Ent. Soc. Wash., vol. 10, p. 162–3) has already noted the occurrence of the roach parasite, *Rhipidius*, in coasting steamers to Central America.

EASTERN SYMPHOROMYIA ATTACKING MAN.

(*Diptera, Leptidæ.*)

By R. C. Shannon, *Bureau of Entomology.*

The blood-sucking habit of certain species of *Symphoromyia* has been repeatedly observed in the Rocky Mountain region, but there have been no records of this habit from eastern North America. While collecting on one of the thickly wooded islands below the Great Falls of the Potomac this spring (May 31, 1915), the writer noticed that small swarms of these flies would gather about him while he was moving about. When he remained quiet they would sometimes alight, most frequently upon his uncovered head. One alighted on his neck and started biting but was caught before she had imbibed any blood. The bite was quite as severe as that of *Chrysops*, while their flight was slower and the buzz lower. It was hoped that more would bite but they were very shy and would remain only a short time. Only six specimens were collected and they were kept alive until the following day when attempts were made to induce them to bite the writer's arm, but they refused and remained passive even when blood was supplied by pricking the skin. These flies were taken on a bright midday on the northern slopes of a rocky hillside, which had been burnt over the preceding fall. In other localities of the same region only occasional specimens were taken.

These specimens are probably *Symphoromyia hirta* Johnson, although they do not agree in coloration with typical specimens. The antennæ and the legs, except the coxæ and the trochanters, are entirely yellow; the coxæ are black, dusted with cinereous, and the trochanters are shining, black. The size and all the other characters agree with *S. hirta*.

Besides the above mentioned specimens, the writer has collected one male and two females differing from the above mentioned ones in having the legs, except the knees, wholly black; the male from Virginia opposite Plummer's Island, Md., 18. V. 15; one female, Maryland opposite Plummers Island, 3. VI. 14, and the other female taken at Dead Run, Fairfax County, Va., 9. VI. 15. Five more females of the form with yellow legs were captured at

Dead Run, Fairfax County, Va., May 28, 1914, May 23, and June 9, 1915. Mr. Knab is of the opinion that these two forms are but color-variants of one species.

THREE INTERESTING ORTHOPTERA FROM THE VICINITY OF WASHINGTON, D. C.

By A. N. Caudell, *Bureau of Entomology.*

To our local fauna three species of Orthoptera are to be added. One, *Cryptocercus punctulatus* Scudder, was taken on Cupid's Bower Island, Md., a small island in the Potomac River some distance below Great Falls. Three specimens of this interesting roach have been taken, two by H. S. Barber on May 23 of the present year and one by R. C. Shannon on May 31. These roaches were taken in decayed pine logs. This species seems to be very local in occurrence but enjoys a wide distribution, ranging from the Atlantic to the Pacific and from Canada on the north, south to about the 34th parallel, the furthest southern record, I believe, being Rome, Georgia.

Another insect not at all common in the regions surrounding Washington is *Melanoplus collinus* Scudder. Numbers of both sexes of this grasshopper were taken at Great Falls, Virginia, on September 12, 1912. It occurred in some numbers in the open woods just below the picnic grounds at the Falls.

Melanoplus punctulatus Scudder occurs in pine woods and has been taken but once by me in the District, a single male near the upper reservoir north of Georgetown. A male was collected on Plummer's Island, Md., by Douglas Clemons on August 11, 1905 and the species has also been taken at Falls Church, Va.

MIGRATING ARMIES OF MYRIOPODS. (A CORRECTION).

By H. S. Barber, *Bureau of Entomology.*

Mr. R. V. Chamberlain of the Museum of Comparative Zoology has kindly examined specimens of the Myriopod from Humboldt Co., Cal., mentioned on pp. 121–122 of this volume but his reply was received after the number had gone to press. He writes that the specimens are immature and cannot be positively determined but belong to the leptodesmid genus *Chonaphe* and are probably *C. armata* (Harger.)

Two Hundred and Eighty-Eighth Meeting, October 7, 1915.

The 288th regular meeting of the Society was entertained by Mr. E. A. Schwarz at the Saengerbund Hall, October 7, 1915. There were present Messrs. Barber, Burgess, Caudell, Crawford, Ely, Gahan, Greene, Heinrich, Howard, Knab, Kotinsky, Marlatt, Middleton, Pierce, Quaintance, Rohwer, Sanford, Sasscer, Schwarz, Shannon, Turner, and Walton, members and Max Kisliuk, visitor.

The Corresponding Secretary presented a communication inviting the Society to send a delegate to participate in the deliberations of the Second Pan-American Scientific Congress to be held in Washington, D. C., December 27, 1915, to January 8, 1916. The Society named as delegate to the Congress, President A. N. Caudell; alternate, First Vice-president C. R. Ely.

Mr. Rohwer announced the death of Mr. H. M. Russell, a member of the Society and moved that a committee be appointed to draw up suitable resolutions. The motion prevailed and the President appointed as a committee Messrs. Quaintance, Hyslop, and Walton.

The following program was presented:

Parasitic Work of the Hawaiian Sugar Planters' Association, Dr. L. O. Howard[1]

THE TACHINID FLY MAUROMYIA PULLA COQ. AND ITS SEXUAL DIMORPHISM.

By W. R. Walton,

U. S. Bureau of Entomology, Cereal and Forage Insect Investigations.

In describing this fly[2] as the representative of a new genus and species Mr. Coquillett had before him but two specimens of the insect. These he considered as belonging to opposite sexes. Quite recently Mr. E. Daecke of Harrisburg, Penn., submitted to the writer several specimens of Tachinidæ selected from a large series collected by himself at Carlisle Junction, Penn., which

[1] Withdrawn for publication elsewhere.
[2] Revision of the N. A. Tachinidæ, p. 51.

I believe to represent the undescribed male of *Mauromyia pulla* Coq., and, after a careful study of the material in the U. S. National Museum, I am convinced that Mr. Coquillett never saw the male of the species.

Since considerable dimorphism is apparent, especially in some characters which have been considered as of prime specific and even of generic index, it seems well to describe the male and also to note some of the more remarkable variations in structure peculiar to this rather extraordinary form.

Mauromyia pulla Coq.

Male. Head (fig. 1, *1*) quadrangular in side elevation, its anterior border distinctly concave. Cheeks nearly as wide as eye-height. Inferior occiput swollen. Front produced directly forward, not sloping downward to base of antennæ. First antennal joint unusually long, fully as long as second, produced upward at an angle of 45°, its tip projecting distinctly above the level of the front. Third antennal joint five times as long as second, distinctly short pilose, its lower three-fourths strongly concave on anterior border. Arista thickened on at least the basal three-fourths, first joint slightly longer than broad, second joint at least three times as long as broad. Facial ridges bristly on lowest third. Vibrissæ multiple, the larger pairs subequal, not cruciate, situated on oral margin. Facial depression enormous in width, nearly twice as wide as in female; genovertical plates at narrowest part not more than one-fifth its maximum width. Eyes small, bearing sparsely scattered hairs visible only upon minute examination. Frontal bristles descending to base of arista, the uppermost pair pointing distinctly outward. Front one and one-half times width of eye, vitta occupying considerably more than one-half width of front, brown. Sides of front cinereous, pollinose sprinkled with coarse black hairs; orbital bristles absent. Face on lower half bearing two or more irregular rows of small macrochætæ, the lowest ones reaching below lower border of eye. Ocellar bristles rather weak, directed forward, the postocellar pair well developed and directed vertically. Wings brownish hyaline, broad, rather short, costal spine obsolete. Apical cell long-petiolate, ending very slightly before wing tip. Bend of fourth vein variable, forming an angle of 45° in some specimens (fig. 1, *2*), in others bent considerably inward in a distinct curve (fig. 1, *3*). A short stump present or occasionally entirely absent. The longitudinal and cross veins bordered with a light but distinct brownish stain. Hind cross-vein usually bisinuate. Sterno-pleural macrochætæ varying in arrangement and number from two to five. Abdomen flattened ovate, slightly more slender than in female but otherwise quite similar. First segment bearing a weak marginal pair, the remaining segments with both discal and marginal macrochætæ. Hypopygium prominent, bent forward, its basal ring shining black, the remainder nearly opaque.

The female differs as follows: in the very much shorter antennæ, length of second aristal joint (figs. 1, *1a*, *1b*), shape and extent of facial depression, extent of thickening of arista (figs. 1, *1a*, *1b*), presence of orbital bristles, absence of discal and sometimes marginal bristles of abdominal segments.

These facts show how inadvisable is the practice of proposing genera upon scanty material representing but one sex.

Mr. Daecke, to whom I am indebted for specimens and notes, states the flies were taken in large numbers from the trunk of

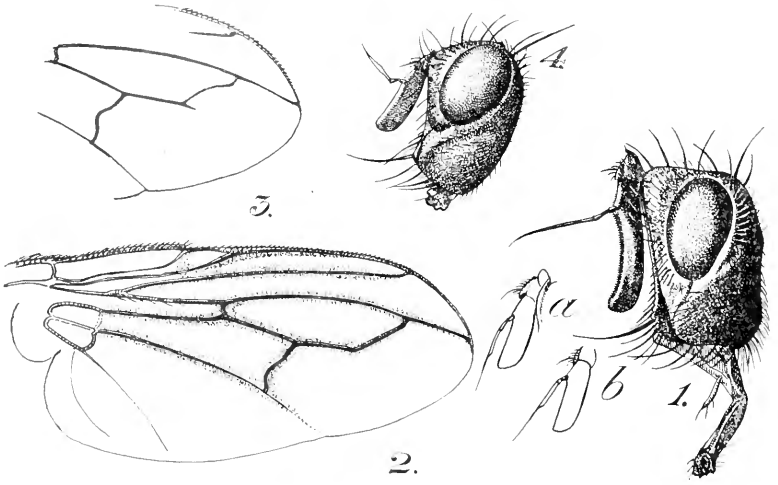

Fig. 1. *Mauromyia pulla* Coq.

1. Head of male lateral view. 1a. Antenna of female showing elongate second aristal joint. 1b. Antenna of another female showing second aristal joint abbreviated. 2. Wing of male showing bend of fourth vein destitute of appendage. 3. Wing of another specimen of same sex with the bend appendiculate and the vein beyond bent inward.

4. Head of male *Paradmontia brevis* Coq.

a tree about which they were running with the prominent antennæ held in a porrect position. Mr. Chas. T. Greene has also loaned specimens, both male and female, which have been of much value in the study of the species. These were collected at Lehigh Gap, Penn.

Some doubt has heretofore existed regarding the distinctness of the two species, *Mauromyia pulla* Coq. and *Paradmontia brevis* Coq., although the former has a bare and the latter a bristly first longitudinal vein. This uncertainty is now happily elimi-

nated by the discovery of the male of *Mauromyia pulla*. A drawing of the head of *Paradmontia brevis* (fig. 1, *4*) is provided herewith for the purpose of comparison.

DUNG-BEARING WEEVIL LARVÆ.

By Frederick Knab, *Bureau of Entomology*.

The habit of covering themselves with a coating of their own excrement occurs in the larvæ of several genera of Chrysomelidæ. Of these *Blepharida* and certain species of *Lema* and *Crioceris* are familiar examples. No such habit has been recorded for the weevils and its occurrence is the more remarkable when one considers that in this group but a small proportion of the species have externally feeding larvæ. The writer has observed the dung-carrying habit in the larvæ of two species of Ceutorhynchini, *Cælogaster lituratus* Dietz and *Perigaster obscurus* LeConte.

The first observation was made in 1902. On August 5 of that year Mr. J. O. Martin and the writer were collecting on the slopes of Mount Holyoke, Massachusetts. Mr. Martin called my attention to some small groups of larvæ of different sizes on the leaves of a plant of *Œnothera biennis*. The larvæ were of the characteristic form of those of *Lema*, robust and much thickened medially, and were covered with moist dung. The color of the body was a pale translucent yellowish tint and the head was reddish brown. The body was covered with a slimy secretion in which the excrement was imbedded and this latter was distributed so well that only the prominent lateral callosities were visible. The slimy secretion probably is a product of the malpighian tubes.[1] The larvæ were kept alive for rearing and on August 8 the largest of them had enclosed themselves in cocoons of dry dung. The body of the larva, now divested of its coating of slime and dung, had changed to opaque yellow and the head showed a brighter ferruginous tint. The pupæ were bright yellow. The beetles reared from this material were kindly determined by Dr. W. G. Dietz as *Cælogaster lituratus* Dietz.

The following year, 1903, on July 14, Dr. Geo. Dimmock again found the larvæ in the vicinity of Westfield, Mass., and as before on *Œnothera*. Some of these larvæ were reared and produced imagos of the same species. Others of the larvæ were boiled in alcohol, for preservation, and it was found that the thick coating of slime hardened and detached in the form of a shell which still retained the imbedded excrement.

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[1] See discussion of the secretions of weevil larvæ, this volume, pages 154–158.

Dung-bearing weevil larvæ were again found on September 1 and 14, 1912, at Hyattsville, Md. In this case the food-plant was *Ludwigia alternifolia* L., a plant closely related to *Œnothera*. The beetles reared from these larvæ were determined by Mr. W. D. Pierce as *Perigaster obscurus*. The larvæ usually occurred singly on a leaf and but a small number on the same plant. They were mostly on the under side of the leaves, though occassional ones occurred on the upper side. They ate elongate holes into the leaves, or pieces out of their sides. Most specimens of the food-plant, scattered over the open, wet gravelly ground, showed the work of the larvæ. On September first the larvæ were abundant and of various sizes, but two weeks later larvæ could only be found on three plants and these were all full-grown or nearly so.

As in the case of *Cælogaster lituratus*, the larvæ were entirely covered dorsally with their own excrement imbedded in a secretion from the anus. The secretion flows down the sides and gives the entire larva, excrement included, a shining appearance. As in *Cælogaster*, the larva is short and stout, high medially, the body-segments forming a series of strongly convex ridges which are tuberculately produced at the sides; from these tubercles the spiracles project like minute papillæ. The color of the body of the larva is dull creamy yellow, its head pale ferruginous. The excrement is nearly black and the secretion brownish yellow, the latter probably being stained by the excrement. The excrement is carried forward from the anus by peristaltic movements of the body segments, which are particularly violent posteriorly. The result is that the excrement accumulates on the anterior portion of the larva and there overhangs the head, as well as extending down the sides.

When about to pupate the larva gets rid of its covering and shapes it into a cocoon. At this time the larva is opaque bright yellow; the pupa is of the same color. Larvæ kept in close confinement in a tin box did not always succeed in shaping a cocoon. When they came in contact at this time the secretion caused them to stick together and they appeared unable to free themselves. Of the larvæ brought home September first, a number had transformed to beetles by September 8 and the remainder issued within a few days after. The larvæ probably normally pupate on the ground. No trace of the pupæ could be found in nature, except a single cocoon upon the upper side of a leaf of the food-plant near the ground. This plant stood in a very wet place, where there must have been water two or three days earlier.

THE MATING HABITS OF SOME SAWFLIES.

By S. A. Rohwer, *Branch of Forest Insects, Bureau of Entomology.*

There is very little information concerning the mating habits of sawflies published and it is believed that the following observations are worth recording. Especially is this true if the writer's belief, that the value of a character cannot be properly rated until its function or relation to the life cycle of the species is understood, can be considered feasible. Taxonomists of sawflies have so far paid very little attention to the male genitalia, but when these parts are used for taxonomic purposes it is very probable that in many groups it will be found that the concavity-shape and structure of the cochlearium will offer valuable characters. The shape and length of the penis and preputium will offer other useful characters.

The terminology of the male genitalia used in this paper is that given by Hartig in "Die familien der Blattwespen und Holzwespen" Berlin, 1860.

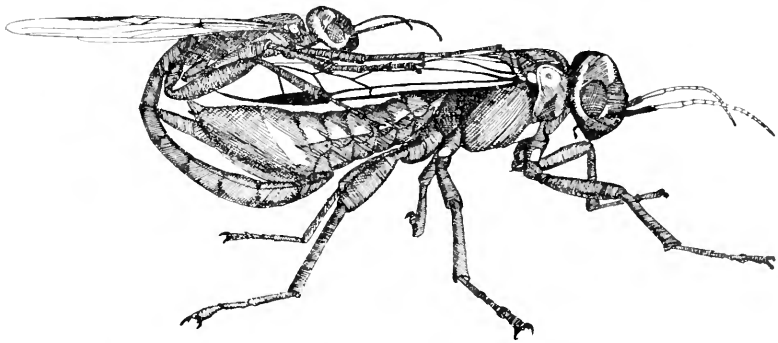


Fig. 1. *Xiphydria maculata* Say. Male and female in coitu. (Drawing by Wm. Middleton.)

XIPHYDRIA MACULATA SAY.

This species emerges early in the spring and from the notes available it would seem that every female mates. The notes on copulation presented here are summarized from many observations. In no case was there any courting and mating usually occurred whenever two sexually active individuals of opposite sexes came in close promixity. There is a great variation in size of individuals of this species but, as far as the observations went, size played no part in determining whether two individuals would mate.

In copulation the male rides on the back of the female curving the tip of his abdomen under the tip of her abdomen so the cochlearii of the extended genitalia grasps the side of the knob at the base of the sheath and the hypopygidium fits over the knob. The use of the preputium and penis was not observed. During copulation which lasts about 90 seconds there is a contraction and expansion of the muscles of the stipes so there is a strong push and pull motion. The wings are held flat against the body. The legs of the female are placed in the usual position assumed when resting, i.e., the fore legs directed anteriorly, the middle legs almost at right angles, the hind legs slightly posteriorly. The antennæ may be held still or waved slightly.

DIPRION LECONTEI (FITCH).

These notes dealing with the mating habits of *Diprion lecontei* are summarized from extensive notes on this species which have been accumulated at the Eastern Station of Branch of Forest Insects, and the material used came from localities covering most of the range of the species although most of the detailed notes were made on material collected near Falls Church, Va.

In the life history of this species there are some interesting and unusual conditions. The one which concerns this paper may be summarized as follows: In the first generation mating is the rule while in the second it is exceptional. In localities where there is only one generation mating normally occurs and there is a preponderance of males; in localities where there are two or more generations mating occurs normally only during the first, but in such localities mating may be witnessed throughout most of the season because of the great overlapping of generations. There is no courtship in this species, and the females of the first generation take as active a part in finding a mate as does the male while the females of the second generation will fight and may kill a male rather than mate. During copulation the wings are held flat against the body; the legs are spread rather far apart, the fore legs projecting anteriorly, the middle slightly anteriorly and the hind posteriorly; the antennæ are usually moved slowly up and down.

Copulation lasts about 100 seconds and is accomplished by the two individuals facing in opposite directions and the extreme end of the male abdomen being bent at an obtuse angle because of the truncate abdomen of the female. The hypopygidium of the male fits over the knob at the base of the sheath, the cochlearii grasp the sides of the knob in the manner of a ball and socket joint while the position occupied by the preputii and penis was not observed although they are probably used as in *Euura*

EUURA MACGILLIVRAYI ROHWER.

The notes on the mating of *Euura macgillivrayi* were made from a number of males and females which issued from galls collected in the type locality by Frank W. Rohwer. In this species there is no real courtship, but when individuals have freshly emerged and are sexually active they are more excited when in close proximity with an individual of opposite sex, as is evidenced by the rapid movement of antennæ and wings. There is, however, very little evidence of a positive power of recognizing the opposite sex because occasionally a male would seize another male or more rarely a female would seize another female. Unlike certain other insects the female of this species takes as active a part in looking for her mate as does the males as is proven by the fact that in a number of instances a female would seize and endeavor to mate with a tired male. In some few instances one female mated with two different males but as far as the observations went no male mated more than once. During copulation the wings are held close against the body or but slightly above it; the legs are spread rather far apart, the fore extending anteriorly, the middle at right angles with the body and the hind distinctly posteriorly.

Copulation occupies about 65 seconds and is accomplished by the two individuals facing in opposite directions. The hypopygidium of the male extends over the knob at the base of the sheath, the cochlearii grasp the sides of the knob after the fashion of a ball and socket joint, while the preputii and penis are inserted in the opening at the base of the sheath. When mating is completed the female endeavors to free herself of the male by using the hind legs and saw or if unsuccessful at first the sheath is used. There is apparently no expansion or contraction of the muscles of the stipes. After mating both sexes "dress" their abdomen with their hind legs.

PTERONIDEA VENTRALIS (SAY).

I have never had an opportunity to observe the mating of this species, and the notes here given are taken from a pair captured in coitu (and remaining connected) by C. T. Greene at Plummer's Island, Md., July 2, 1912, and from pictures taken at Plummer's Island, Md., by H. S. Barber. Mr. Barber's photographs are very interesting and would lead one to infer that the female of this species may mate more than once and with different individuals. From the attitude assumed by the male in figure 1 of plate XXII it is evident that the male is more excitable than the female.

From the pair secured by Mr. Greene the position assumed by certain parts of the genitalia may be described as follows: The hypopygidium fits over the knob at the base of the sheath while the cochlearii grasp the side of the same knob in the manner of a ball and socket joint. The position of the other parts cannot be seen.

HYPARGYRICUS FUMIPENNIS (NORTON).

Mr. J. C. Crawford captured a pair of this species in coitu on Plummer's Island, Md., April 22, 1915, and notes that they were facing in the opposite directions.

EXPLANATION OF PLATE XXII.

Pteronidea ventralis (Say). A and B—Two perfect individuals, male and female, mating. C, D and E—female which has lost her flagelli being "courted" by three males. In D and E the female is mating with the male at the left. (Photographs by H. S. Barber at Plummer's Island, Md., on leaves of *Salix niger*).

AMETASTEGIA GLABRATA (FALLÉN), A HOLARCTIC SAWFLY.

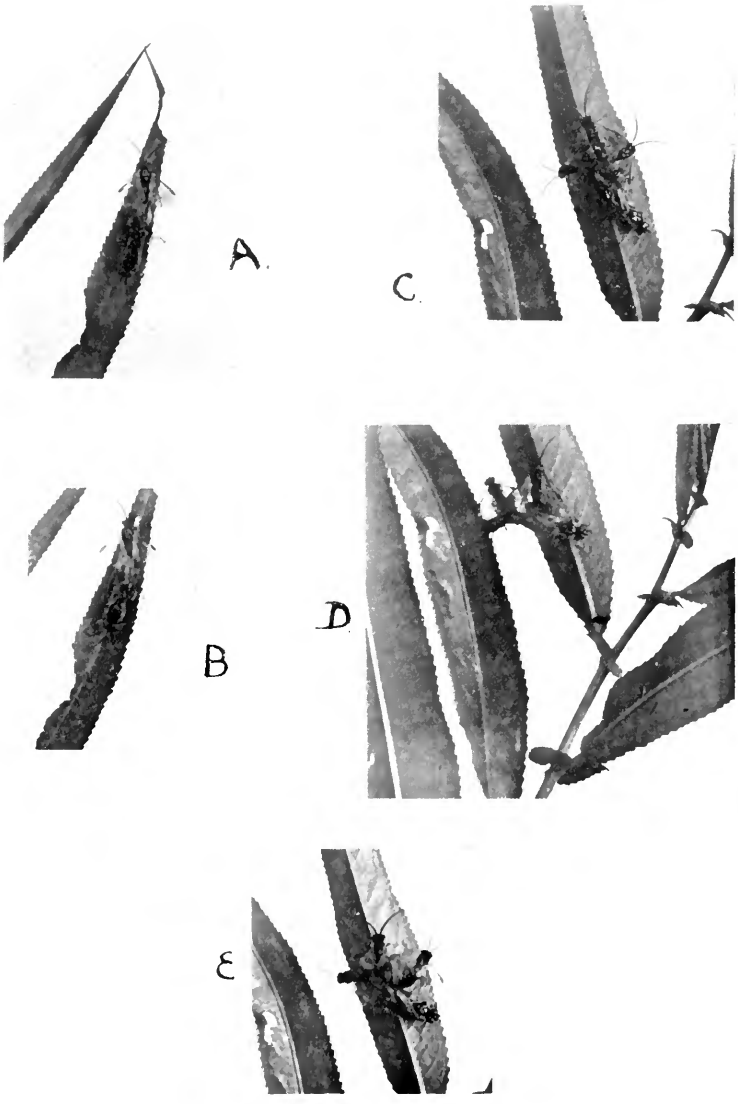
By S. A. Rohwer

Branch Forest Insects, Bureau of Entomology, Washington, D. C.

The "dock sawfly," *Ametastegia glabrata* (Fallén), has been known in America for many years and has heretofore been considered as a native species. Whether it is a native holarctic species or whether it was introduced from Europe may never be decided, but it is very certain that the American and European specimens are morphologically identical and inasmuch as they have the same habits it is believed the following synonymy is justifiable. The European synonymy is copied from Enslin.

AMETASTEGIA GLABRATA (FALLÉN).

Tenthredo glabrata Fallén, Svensk. Vet.-Akad. Handl. 1808, p. 108.
Tenthredo (Allantus) agilis Klug, Magaz. Ges. Naturf. Fr. Berlin, VIII, 1814, p. 208.
Tenthredo (Allantus) rufipes Lepeletier, Monog. Tenthred. 1823, p. 81.
Ametastegia fulvipes A. Costa, Rend. Acad. Sc. Napoli, vol. 21, 1882, p. 198.
Emphytus nigrisoma Norton, Proc. Boston Soc. Nat. Hist., vol. 9, 1862, p. 139; Tr. Amer. Ent. Soc., vol. 2, 1868, p. 165; Provancher, Nat. Can., vol. 10, 1878, p. 165; Fauna ent. Canad., Hym. 1883, p. 214; Jack,


A
C
B
D
E

Can. Ent., vol. 25, 1893, p. 183; Chittenden and Titus, Bul. 54, U. S. D. A. Bur. Ent. 1905, p. 40–43; Fletcher, 33d Ann. Rept. Ent. Soc. Ontario 1902 (1903) p. 86; 34th l. c. 1903 (1904), p. 70; Harrington, 33d Ann. Rept. Ent. Soc. Ontario 1902 (1903), p. 100; Webster, R. L., Jn. Econ. Ent., vol. 1, 1908, p. 310.

Strongylogaster abnormis Provancher, Addit. fauna Can. Hym. 1885, p. 10; Dyar, Tr. Amer. Ent. Soc., vol. 25, 1895, p. 311–312; Can. Ent., vol. 27, 1895, p. 340; Jn. N. Y. Ent. Soc., vol. 5, 1897, p. 199.

TWO NEW SPECIES OF SIMULIUM FROM TROPICAL AMERICA.

By Allan H. Jennings, *Bureau of Entomology.*

During 1913 a commission headed by Dr. Louis W. Sambon was sent from England to the West Indies and adjoining regions to investigate pellagra and its manner of transmission. Through invitation the writer was able to accompany this expedition with the special object of investigating the insects that might have a bearing on the transmission of the disease. Special attention was given to *Simulium* and among the material collected were the two new species described below. I am much indebted to Mr. Knab for assistance in this connection. Details of the biology of these species will be published in another place.

Simulium samboni new species.

Female. Occiput, frons and face black, densely light silvery gray pollinose. Antennæ rather stout, brownish yellow, darker distally, the first two joints honey yellow and smooth, the others clothed with short whitish pile. Palpi blackish. Mesonotum bright orange-ferruginous, with four narrow, pollinose, grayish-silvery stripes, the outer ones at the lateral margins, the inner pair sinuate, extending nearly to the scutellum and dividing the disk into three nearly equal parts; vestiture of fine, evenly distributed golden hair-scales not forming regular series. Scutellum paler than mesonotum, honey yellow; transverse hair-scales on the disk golden, the marginal bristles black. Postnotum ferruginous. Pleuræ ocher-yellow, strongly infuscated on the mesosternum. Abdomen subcylindrical, black and gray; segments 2 to 5 black and with the margins and two longitudinal stripes gray, thus delimiting three series of large black spots; sixth segment shining, mostly gray. Anterior coxæ yellow, the others infuscated. Legs bright ocher-yellow, the hind pair with the apices of the femora infuscated and the distal halves of the tibiæ blackish, their basal halves with whitish luster; front tarsi blackish, the first joint tinged basally with luteous; mid tarsi with the first joint pale, its distal fourth blackish, the second joint pale on basal half, the last three joints wholly blackish; hind tarsi with the first joint pale, infuscated along its lower margin and on apical third, the second joint pale on basal half, the last three joints wholly blackish; appressed hair-scales partly pale and partly black, in correspondence with the ground-color. Claws simple, thickened at base. Wings hyaline, the venation normal; thick veins pale yellow; anal field without iridescent spot. Halteres pale yellow. Length: Body about 1.5 mm., wing 2 mm.

Male. Holoptic. Antennæ much more slender than in the female. Mesonotum strongly convex, the silvery pollinose ornamentation reduced to two short wedge-shaped spots at anterior margin and visible only in certain lights.

Empire, Canal Zone, Panama, reared from pupæ taken from a small tributary of the Comacho River, October 4, 1913 (A. H. Jennings).

Type: Cat. No. 19996, U. S. Nat. Mus.

It gives me pleasure to dedicate this handsome species to Dr. Louis W. Sambon.

Simulium antillarum new species.

Female. Occiput, frons and face black, densely light silvery gray pollinose; frons moderately broad, but very slightly narrowed anteriorly, nearly parallel-sided. Antennæ rather short, the first two joints ferruginous and nude, the following ones blackish brown and clothed with short whitish pile. Palpi black. Mesonotum bright orange-ferruginous, the region of the humeri and the lateral margins ochreous yellow, a narrow, wedge-shaped dark spot at the lateral suture in front of insertion of wings; on the anterior half two narrow silvery white pollinose stripes, nearly equidistant from each other and from the lateral margins; these stripes are nearly straight, tapered anteriorly and do not reach the anterior margin; vestiture of very fine, evenly distributed black hairs not forming regular series. Scutellum more yellowish than mesonotum, with transverse yellowish hairs on the disk and a series of marginal black bristles. Postnotum ferruginous. Pleuræ ochreous yellow, with some silvery pollinose streaks and with the mesosternum strongly infuscated. Abdomen shining, blackish, tinged more or less with yellow-brown basally and distally, the apical margins of the segments very narrowly pale. Anterior coxæ yellow, the others infuscated. All the femora yellow; tibiæ more or less infuscated, the middle pair lightest, the posterior pair nearly black; tarsi blackish; femora with yellowish hair-scales, tibiæ and tarsi mostly with black hairs. Claws simple, thickened at base. Wings hyaline, the venation normal, the costa infuscated and densely black spinulose, the other thick veins yellowish, a minute dark spot on the crossvein; a large but rather faint reddish iridescent area in the anal field. Halteres pale yellowish. Length: Body about 1.5 mm., wing 2 mm.

Male. Holoptic. Antennæ, much more slender than in the female. Mesonotum strongly convex, the two silvery pollinose marks shorter and broader. Abdomen slender, the first four segments ocher-yellow, the succeeding ones black.

St. Croix, Danish West Indies, November, 1913; Hope River near Kingston and Roaring River close to the falls, Jamaica, September, 1913 (A. H. Jennings).

Type: Cat. No. 19997, U. S. Nat. Mus.

The material was mostly reared from pupæ occurring in rapid streams in the above named localities. In St. Croix, on November 24 and close by their breeding-place, two specimens were captured while biting man.

Actual date of publication December 31, 1915.

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ERRATUM

Page 55, line 3 from bottom, for "Vol. V, no. 1, 1902," read "Vol. VII, nos. 2–3, 1906."

ANNOUNCEMENT

Separates of all the important papers published in the PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON and a number from other journals are for sale at approximately two cents per page (no article less than ten cents). They can be had by applying to the Corresponding Secretary of the Entomological Society. U. S. National Museum, Washington, D. C. No receipt will be mailed for the sale of printed matter unless especially requested.

OF SPECIAL INTEREST

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